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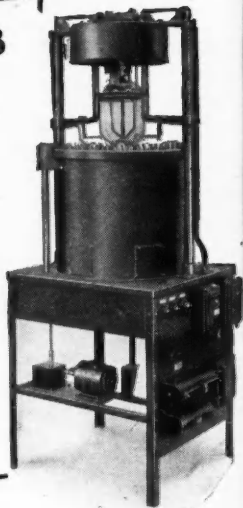
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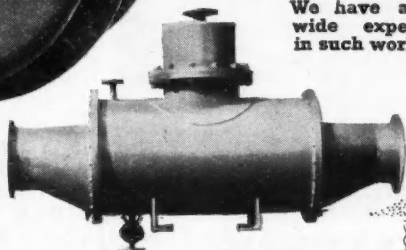
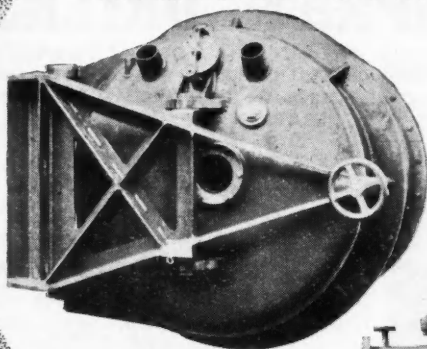
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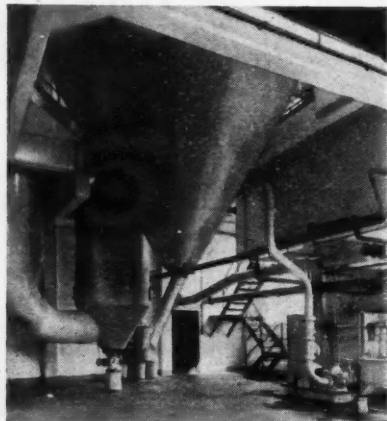
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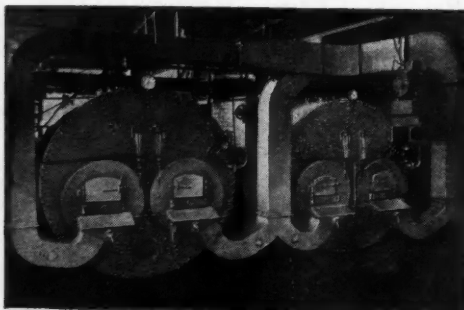
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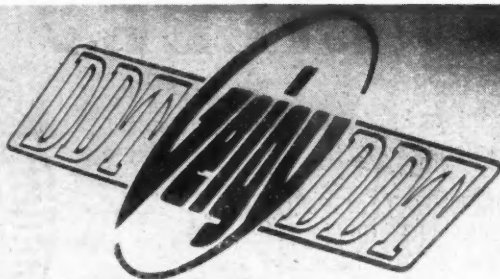
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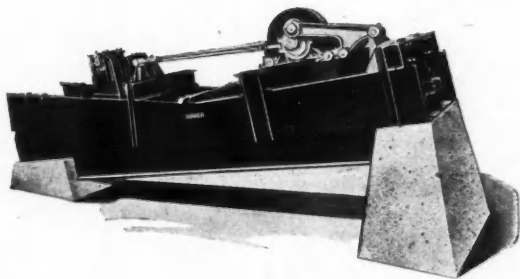
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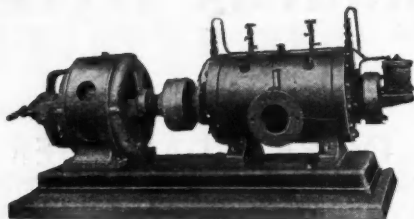
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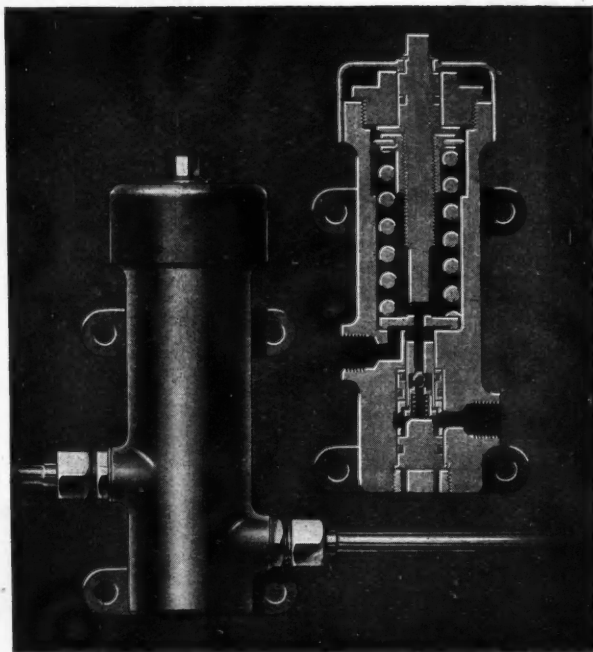
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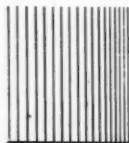
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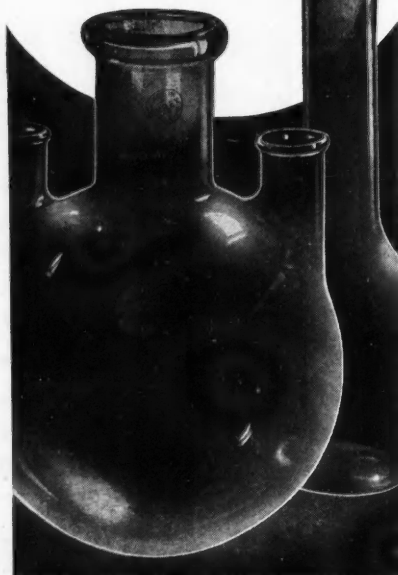
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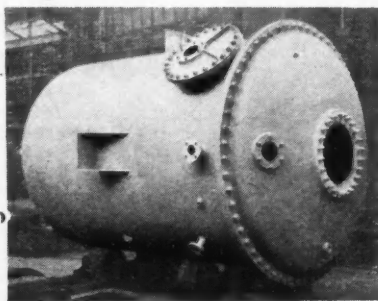
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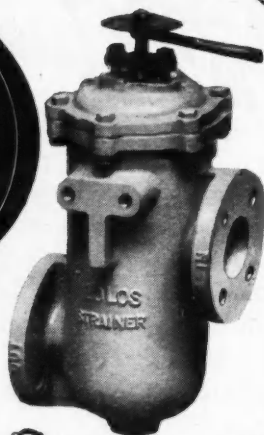
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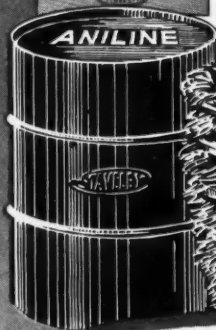
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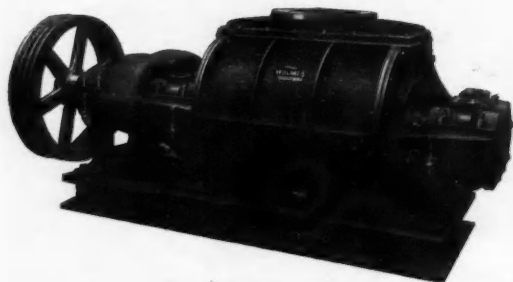
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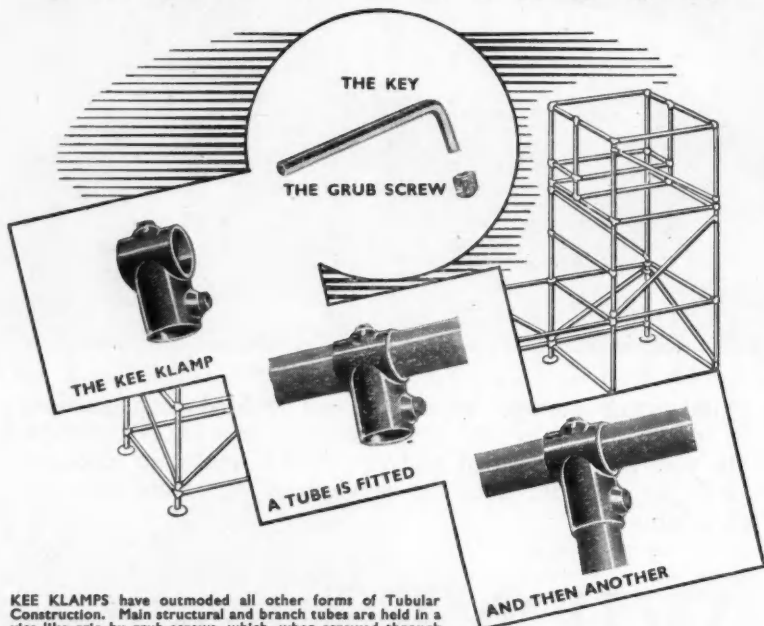
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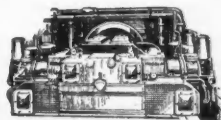
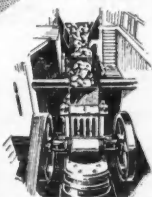
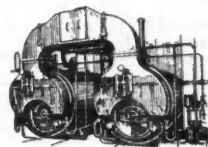
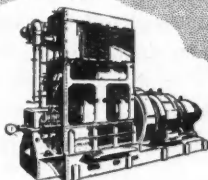
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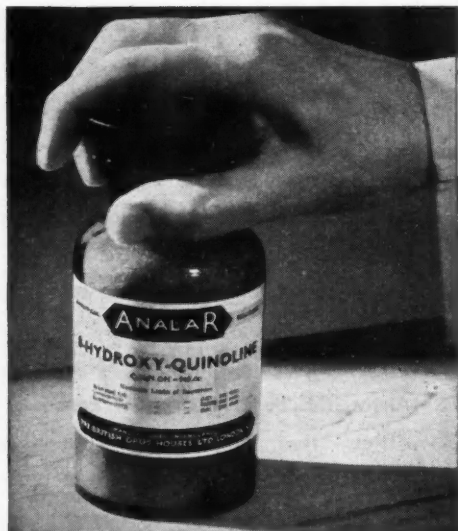
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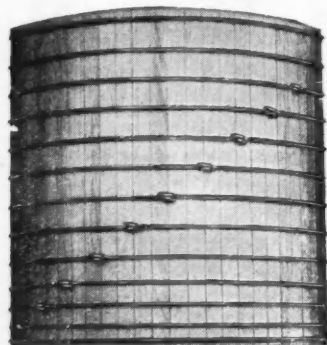
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The Function of an Industrial Chemist

THERE is often a good deal of misconception in the minds of younger men as to the function of industrial chemists. Men still at Universities or lately entered into industry not infrequently have been found to possess high-flown and starry-eyed conceptions of their rôle. It is equally true that some of the older men, brought up in the hard practical school of 20 or 30 years ago have not realised the changes that have taken place. There is, too, a misconception—said to be not infrequently encouraged by engineers!—that the chemist is an inferior being occupying a necessary place amid bottles and stinks in the laboratory, but not worthy to be classed among the practical men who are responsible for production or for the administration of business. To straighten out these false ideas requires clear thinking. We shall endeavour to induce some thought upon the subject, being constrained to do this by perusal of an address delivered some time ago in Manchester by Dr. Cronshaw, now an Elder Statesman of Industrial Chemistry, who has a happy knack of drawing upon his vast experience to give advice such as Nestor might not have disclaimed had he been alive today.

A basic starting point must be the requirements of industry. The industrial chemist, whether he be employed by a firm or as a consultant or as a technical journalist or occupies any other industrial post, is a servant of industry. His task must be to assist to the utmost of his powers the development of the industry with which he is connected. That does not mean that he will neglect his own personal advancement or prosperity; the labourer is worthy of his hire. But it will

always be found that those who labour with singleness of purpose to do whatever lies to their hand for the advancement of the organisation in which they serve will in the end better achieve their personal ambitions than by seeking their own advantage too zealously.

Industry requires more technical men. There is little use for a man who goes out into the world to-day with no special training or qualifications other than his native wit. That appeared to be one way of making vast fortunes a few decades ago, and many are the stories of wealthy men who started selling newspapers in the street or in some equally humble manner. They are the exception and the opportunities for that sort of advancement are becoming scarcer every year. Under a largely nationalised industry they will disappear. Every man who hopes to make his mark in industry or in other walks of life must start with a thorough understanding of some particular subject. The chemist starts with an understanding of chemistry, and it is by virtue of that understanding and knowledge that he will be worth his salt right through his life. The need for technical men in industry was never greater. Industry in this country must keep abreast of the industries of other nations. To do that, research and development work is needed. Let us not fall into the mistake of believing that only the man in a research laboratory is called upon to undertake research or has the power to make important advances. Dr. Cronshaw has told us that 60 per cent of the discoveries made by the great German firm of I.G. were made by those who would here be designed "works chemists." British

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industry must be based on research. That is our foundation for the future. The man who has technical ability and discards it for no good reason is false to his profession and is not pulling his weight.

Is the chemist then to spend his time in endeavouring to devise some new thing? Again, we should not agree that that is his main vocation unless he is engaged entirely on research. The chemist must look for his opportunities. Synthetic rubber was discovered as long ago as 1891 by Tilden and others; but no one wanted it. There were not enough chemists who could undertake the development of the crude mass produced in the laboratories of those days, or who saw that it could have any possible industrial and commercial future. The chemist will be expected by his industry to maintain a sharp look-out for opportunities of that kind. Above all, he is and must remain at heart a chemist. There are many who have cheerfully shed their chemical status and knowledge at the first opportunity. They are not true chemists and their's is not the kingdom of heaven. Obviously they should never have been chemists.

Some fundamental requirements of the chemist can now be stated. In the first place he must identify himself with the industry he serves. He must have a thorough understanding of his industry, its history and outlook and its methods. He must know what it seeks to achieve. Industry, in Dr. Cronshaw's words, "seeks the continuous repetition of the repeatable experiment and has perforce to do this by translating this ability from maybe the unique level of skill which first showed it to be repeatable to a much lower one. . . . These translations of skill are not matters for a fairy wand. They arise out of patience

and precise definition of chemical and physical conditions; utilisation of measuring instruments and equipment designed especially for the carrying out of these reactions and processes. And it is by this procedure and none other that industry ensures that the skill of the rare few shall be translated into the power of the many." It is to the chemist no less than to his first cousin, the chemical engineer, that industry must look for achieving this objective. Therefore a chemist should be proud of his profession and in love with his science. Again quoting Dr. Cronshaw: "It is unfair to expect that so small an initial intellectual capital as that acquired in a few years at a university could provide so continuous an income." To the industrial chemist, therefore, no less than to his academic brother, chemistry must be a continuing interest, and the chemist must willingly accept as a burden of his vocation the responsibility of continuously keeping up with his chosen subject. Chiefly, and above all else, industry expects of the chemist who serves it that he shall be and remain a first-class chemist. Chemistry is his peculiar professional contribution to industry which differentiates him from all the other experts, and from the rank and file, who are serving industry in other capacities. It is true that an industrial chemist should be practical. He should know something of engineering, something of cost accountancy, something of patent law and so forth but all these can be picked up in the course of his work as a chemist. That is the opinion of Dr. Cronshaw and it is an opinion with which we concur, provided always that the chemist remains primarily a chemist and is not expected to play the lead in other professional activities.

The function of the chemist is changing. Originally the very few chemists that were employed by industry were primarily analysts. The analytical chemist was needed in those days to see that unscrupulous sellers did not unload upon the firm materials or other goods below the standard which they were supposed to be. The phrase *caveat emptor* was coined in the days of the Roman Empire and lingered on into the early part of the 20th Century. It is no longer necessary to regard deliveries of raw material, etc., as suspect, because in the modern world reputable firms rely upon the quality of their product. The chemist to-day has achieved a far higher status than ever he had before, and with it a higher scale of salary, because he is more important in industry than ever before. The chemist is in fact a necessary part of most industrial processes and they should be used in this manner. The chemist pervades all processes and Dr. Cronshaw believes that not only should he pervade all stages of production but he should in fact take charge of production. He bases this on the analogy that the best orchestras are those conducted by first-class musicians.

The chemist, therefore, today is closely identified with management right from the time when he first enters on an industrial career. His responsibility may be small at the start but it will grow and even

though he may not be exercising the functions of a manager, nevertheless his job is an essential part of management. Management is not impersonal. Too often it is anonymous; on the contrary, however, the management of a business is fundamentally similar to the management of an army. There must be officers of all ranks and they must lead by their personal example.

On this subject Dr. Cronshaw has this to say: "I think the recent war has shown how real command existed at every level of the Forces. It was perhaps part of Montgomery's great success as a leader that he realised the necessity for this delegation of responsibility and the transfusion of initiative that accompanies it, and apparently took infinite steps himself to bring it into being and to see that the principle should be abundantly served." That principle is equally true in industry. The chemist, whether he be at the bottom or at the top is one of the officers of industry and should so regard himself. According to his personal qualities he may occupy any position between the humble lieutenant engaged on routine work and the General directing the activities of the whole firm. The industrial importance of the chemist is very great and the chemist should recognise this and act accordingly. But always, and ever, he must be a chemist by profession and knowledge.

NOTES AND COMMENTS

A Bad Start

COAL, the key to whatever prosperity our industries may win for us in the coming months, irrespective of the success or failure of the B.I.F. or any other trade promotion tactic, is in the news again. The first day of the five-day week in the pits finds some 27,000 miners in Durham raising no coal at all because 150 colliery winding men belatedly discover they will earn less under the new "plan for leisure" and are disgruntled because their union does not share the deferential attention which the Mineworkers' Union receives in Government circles. Amid all the implications of this inauspicious beginning to the new regime in the mines—any ill effects of which will, as usual, be borne by industry and the general public—two facts are inescapable. If, in addition to the 18

million tons of coal which must be sacrificed to provide a five-day week, further large-scale deductions are going to be imposed by dissident groups of the inadequate mining force, the restoration to industry of the "full" summer coal ration promised by Sir Stafford Cripps will not be implemented. And in the present state of inter-union politics is observable a grim similarity to the battles of the union bosses which in the U.S.A. produced such spectacular chaos in recent years. The battle has shifted ground now that there are no private mine managements in the field. If we are now to be treated to the spectacle of a four-handed contest between union and rival union, the Ministry of Labour and the National Coal Board the carnage will not be less and the results even more lamentable.

Domestic Explosive

SOME stirring of the analytical spirit enlivens even the House of Commons from time to time. It was astir once more last week when the House with more unanimity than is its custom demanded from Food Minister Strachey the formula of the domestic cooking fat ration and the property which compels it to spit venomously and sometimes "to turn blue and explode in the eye of anyone foolhardy enough to put the fat in a hot frying pan." An attempt to put the blame on Imperial Chemical Industries ("Is it not the case that this fat is supplied by I.C.I.?") was frustrated by Mr. Strachey's reply: "Not in all cases." Standard cooking fat, according to the Food Minister, consists of soft vegetable oil, palm kernel oil and hardened whale oil (VO + PKO + WO?) and the palm kernel oil is the cause of its spitting in the frying pan, but must continue to be included until our East African groundnut plantations begin to return a crop." Would the Minister say whether he can guarantee any cautionary interval between the fat turning blue and starting to spit?" demanded Mr. Keeling, and Mr. Gallacher's inquiry whether the Minister was aware that hon. Members on the other side "were likely to turn blue and explode tonight" was capped by Mr. Drayson's acid suggestion that a little palm oil was a feature of all Socialist administration. To all of which the Food Minister preserved that masterly silence which has served him

so well on several occasions in the past when the House has shown a taste for research in the chemical and other constituents of our State-provided diet.

Secrecy

ATOMIC secrecy is now apparently extending into the industrial medical field. A speaker at a conference on industrial health, organised by the North-west area of the Association of Scientific Workers in Manchester recently, referring to illness caused by radio-activity, said that he had received a letter which advised him that any detailed disclosures on the subject might constitute a breach of the Official Secrets Act. He was thus not allowed to say what the sickness was which was affecting workers engaged on atomic research nor could he give their number or where they came from. Although the Americans have had much experience of radio-active burns and illness, little of this information has been passed on to us nor do we know much regarding the effectiveness of safeguards which should be adopted in atomic research laboratories. It seems to us that free discussion and full publication on these, principally medical, matters would do far more good than harm and would give confidence not only to chemical workers but also to the public at large. We cannot see how disclosures of an industrial illness can be anything but advantageous, nor do we see how it could put this country in a position in which other countries could take advantage of us. It is a dangerous precedent to endeavour to retain knowledge of illness and possible preventives.



Studious One: *How would you refine a little coarse copper?*

Sporty One: *Educate him!*

Institute of Welding

Conference in North-East

BY arrangement with the Tyneside and Tees-side branches of the Institute an extended meeting will be held on the North-East Coast from June 3 to 6, 1947. The provisional programme is as follows:

June 3, Tuesday, evening.—Reception at King's College, Newcastle-on-Tyne.

June 4, Wednesday, morning and afternoon.—Visit to Middlesbrough. Evening—Conversazione in Newcastle.

June 5, Thursday, morning.—Technical papers. Afternoon—Visits to works on Tyneside. Evening—Dinner at the Station Hotel.

June 6, Friday, morning.—Further visits.

B.I.F. IN FULL SWING

Chemical Section Makes Good Show — Products Old and New

THE chemical section of the B.I.F. at Olympia is an impressive feature. It has a dominating site and faces the scientific instruments section across the main aisle. The I.C.I. stand, the first to greet the visitors, occupying a large corner site, is an interesting example of modern exhibition technique and features, among other things, polythene, and a model of a chemical plant. Other large chemical firms have models and diagrams or are exhibiting the many chemicals, some of them new, which they make.

Across the aisle, in the scientific instruments section, the gleaming laboratory tools of industry make a brave show. There was much interest in one stand here where a glass blower was busily at work making solid stem thermometers.

The impression one gets from the exhibition after a quick look round is that it has been carefully prepared, while the exhibits

are first-class. The relative uniformity of stands, far from detracting from the general appearance, give dignity to the exhibition.

For the chemical manufacturer there is much of practical interest in the shape of new or improved plant and accessories to make well worth-while a visit to Castle Bromwich. There he may see demonstrated, in many cases for the first time, equipment and processes which were developed during the war and are now coming into use in industry generally.

With exhibits impressively covering the entire range of engineering, electrical, building, heating and hardware products, the Castle Bromwich section of the Fair was, as in former years, organised by the Birmingham Chamber of Commerce. There are 1048 exhibitors—132 more than in 1939—and the area occupied by stands is enlarged by 12,000 square feet.

Around the Exhibits in London and Birmingham

An attractive show, featuring a selection of the internationally-known products of the firm and its associated houses overseas, is that of BURROUGHS, WELLCOME & CO, (Stand No. A.1171, Olympia). It is in three sections, devoted respectively to medical, fine chemical and veterinary products. Notable is the "Tubarine" brand injection of d-Tubocurarine chloride, a stable solution—principally used for injection to promote muscular relaxation—which contains one of the active principles of curare, the dart poison used by South American Indians.

The B.I.F. marks the introduction to the home market of the "Birlec-Tama" low frequency induction melting furnace for aluminium and light alloys, though many prospective users may be familiar with the success of the equipment in the United States. This is an interesting exhibit by BIRLEC, LTD., Tyburn Road, Erdington, Birmingham 24 (Stands Nos. D.507-406, Castle Bromwich), which is now manufacturing it for the British market. The furnace on show is a relatively small bale-out type designed for supplying die casting requirements, its holding capacity being approximately 75 lb. per hour, though larger models are available. A standard continuous belt conveyor, controlled atmosphere furnace is also exhibited in operation. This unit, equipped with atmosphere generator operating from coal gas, is used in many industries for bright annealing pressings and other small parts and for bright copper brazing of small steel assemblies. A small "Birlec-Detroit" rocking, indirect arc

melting furnace has been selected for demonstration, since it is impracticable to show the large, production sizes under exhibition conditions. The unit shown is designed primarily for laboratory, development and small-scale production work, having a charging capacity of 10 lb. Examples of "Birlec" high frequency induction heating equipment is also shown. This type of equipment is new to the B.I.F. and includes a small, automatic machine for the rapid surface hardening of steel spindles at the rate of about 600 per hour as well as a larger machine for heating the ends of short bars for upsetting at rates up to 1000 per hour. The former is shown in operation, typifying the remarkable results obtained by high frequency induction heating for heat treatment purposes. The firm is also showing in various forms its electro-dryers for removing moisture from air and gases by adsorption with activated alumina.

Interesting equipment has been assembled for display by CHANCE BROTHERS, LTD., Smethwick, Birmingham (Stand No. D.527, Castle Bromwich) and subsidiary companies. Included is a 500-V.A. power factor, 230-volt, single phase, self-contained engine-driven standby power plant, type No. 0.0.4, this specification covering a completely enclosed power unit suitable for operation over a wide climatic and siting range but intended for indoor installation. A new heavy duty 30-amp. rotary switch is among the exhibits of the subsidiary Austinlite, Ltd.; while Sumo Pumps, Ltd., another subsidiary, is giving a working demonstration of one of the small "C" type

submersible pumps, as well as static exhibits of larger-type submersible pumps.

A range of equipment for accurate measurement and control of temperature in industrial and manufacturing processes and in experimental and research laboratories is being staged by FOSTER INSTRUMENT CO., LTD., Letchworth, Herts. (Stand No. C.622, Castle Bromwich; Stand No. A.1074, Olympia). In addition a number of introsopes for examination of internal surfaces of hollow objects are being shown. The introscope is an optical instrument which records the image by means of convergent lenses which convey it to the eye by ocular intervention. A lamp is introduced to illuminate the surface to be examined, the optical and electrical systems being mounted in a rigid tube of appropriate length and diameter. Some of the instruments shown have been designed specifically for particular jobs, but are suitable for use on other applications. Among the particular applications for these instruments are the examination of cylinder bores, rifle bores, gun barrels, diesel engine jets, and condenser and boiler tubes.

The display by HILLS PATENT GLAZING CO., LTD., Albion Road, West Bromwich (Stand Nos. B.611 and B.512, Castle Bromwich) embraces the range of products of the Hill group. The general expansion of this group in the past eight years is of itself interesting, together with the fact that many of the products of the subsidiaries have been designed around the "Preseweld" system of light steel framing for factory-produced building construction.

Pioneers in Magnesium Field

Active in the magnesium field, having pioneered the development of magnesium alloys in Great Britain and the British Empire, F. A. HUGHES & CO., LTD., Abbey House, Baker Street, London, N.W.1 (Stand No. D.307, Castle Bromwich) is able to mount some interesting lines. This firm created a market for the metal; perfected, in collaboration with its licensees, the technique of casting and fabrication; and through its associated company, Magnesium Elektron, Ltd., established in Lancashire what is to-day one of the largest plants in the world for the manufacture of magnesium alloys. Thanks to its plant and technical facilities for production, fabrication, and research, the firm is able to supply elektron alloys in any form and quantity, and to advise on metallurgy, fabrication, and application of these alloys.

A pump specially developed for the chemical trade for handling viscous and corrosive chemicals is demonstrated by

MONO PUMPS, LTD., Mono House, Clerkenwell, London, E.C.1 (Stand No. 714, Castle Bromwich). This is the "Mono" pump, a working model of which enables visitors to judge its claims to unique characteristics of uniform flow with absence of turbulence, emulsification and aeration. Certainly a pump which will prime itself with certainty, even with high suction lift, and will retain its self-priming properties, even when dealing with viscous liquids and solids in suspension, offers considerable advantages in industry. If these advantages are coupled with resistance to abrasion and corrosion, uniform flow, non-contamination, absence of churning or pulsation and ability to work on the silt, it should capture the attention of a wide range of markets. Although the pump gained much recognition before 1939, the war accelerated developments in design, as demonstrated by its installation on aircraft carriers, all British midget submarines and tank landing craft and on water purification plants used on many successful operations.

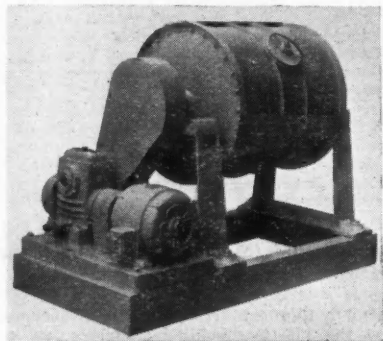
World Sources of Materials

The centre feature of the stands occupied by the Murex group (Stand Nos. D.245 and 144, Castle Bromwich) relates to the products of MUREX, LTD., Rainham, Essex, and is a pictorial presentation of the world showing the sources of the many raw materials brought to the company's works on the Thames for processing. Samples of a selected group of ores are to be seen with the refined metals and chemicals, and a list of the products incorporating these materials is given, with thumbnail sketches adding to the attractiveness of the general layout. In the parent company's section are also seen a display of thermit welding and also of sintered powder magnets, both specialties of the company. One wing of the stands is devoted to the products of Murex Welding Processes, Ltd., Waltham Cross, and daily demonstrations of welding are given. The other wing deals with the products of Protolite, Ltd., another subsidiary company, a selected range of whose products in their various forms are on view, an unusual feature being a display of used dies, tools, and wear resisting parts with samples of the materials processed and comparative performance data. This company is also giving daily demonstrations of negative rake milling.

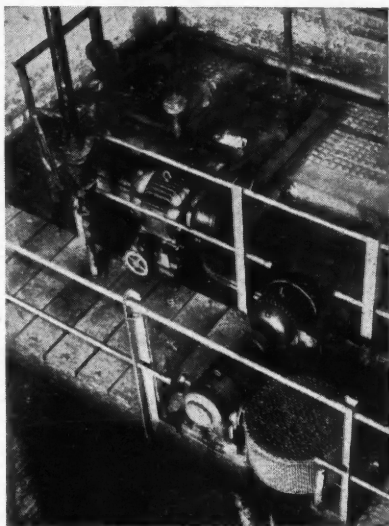
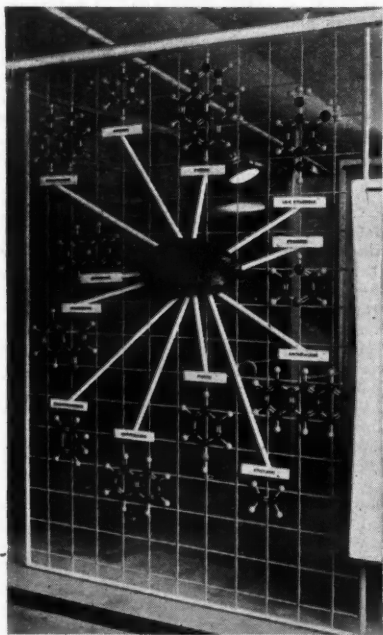
A working model of an all-welded two-lift spiral guided gasholder, the tank of which is 6 ft. diameter and which embodies many patented features, is the main exhibit of OXLEY ENGINEERING CO., LTD., Leeds 10 (Stand No. C.416, Castle Bromwich), specialising in construction of electrically welded gas works plant, oil storage tanks

Exhibits to Look For at the B.I.F.

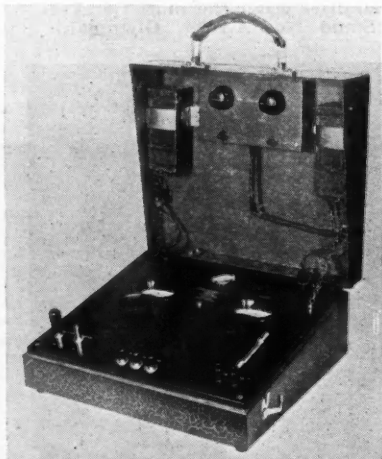
A new departure in ball mill construction—the "Linatex" (Wilkinson Rubber Linatex, Ltd.—Stand No. D.501, Castle Bromwich).



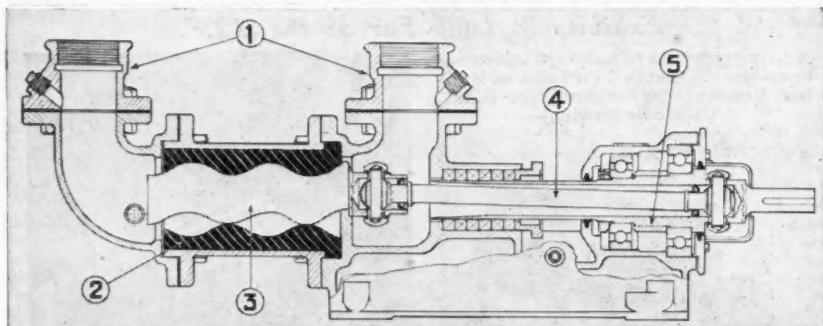
Novel illustration, showing the by-products of coal (United Coke & Chemicals Co., Ltd.—Stand No. A.1056, Olympia).



The D6D "V"-belt-driven "Mono" Pump (Mono Pumps, Ltd.—Stand No. F.714, Castle Bromwich).



Portable potentiometer for thermocouple and pyrometer testing (Foster Instrument Co., Ltd.—Stand No. C.622, Castle Bromwich; Stand No. A.1074, Olympia).



Typical construction of a "Mono" pump. 1. Suction and delivery branches; 2. Stator; 3. Rotor; 4. Universal drive; 5. Driving shaft (Mono Pumps, Ltd.—Stand No. D.714, Castle Bromwich).

and chemical plant. There are also various smaller models illustrating other patents. Interesting photographs, too, are on view, with drawings illustrating many types of plant.

The radio heating of non-conducting materials was introduced into industry on an appreciable scale under stress of war;

Portable "Deminrolit" plant, which by a simple chemical process demineralises water (Permutit Co., Ltd.—Stand No. A.1194, Olympia).



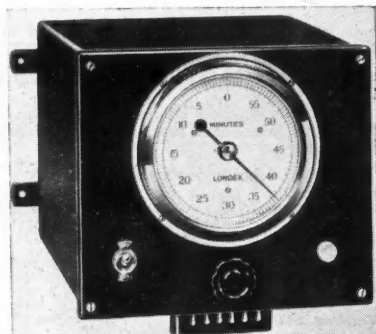
after a thorough trial it has been accepted by the plastic moulding industry as an established aid, and it is now in process of being proved by the rubber moulding industry. This development adds interest to the display by RADIO HEATERS, Wokingham, Berks (Stand No. C.714, Castle Bromwich) of commercial equipment embodying the new process. "Radyne" plastic pre-heaters manufactured by the firm are now operating in many British plastic moulding factories. This range is probably one of the largest available; and the two most popular models, according to the firm, are the "Radyne" H20/B and H7/A, capable of plasticising respectively up to some 20 oz. and 10 oz. of normally dry wood-filled moulding powder per minute.

Ammonia and coal-tar products, acids, electrolytic products, soda products and salt are among the chemicals featured by STAVELEY COAL & IRON CO., LTD., near Chesterfield (Stands Nos. B.517/416, Castle Bromwich).

Manufacturing and supplying all types of scientific laboratory apparatus J. W. TOWERS & Co., LTD., Widnes (Stand No. A.1049, Olympia) includes among its exhibits analytical, air-damped and semi-micro balances; analytical weights; sliding weight balances; electric ovens and furnaces; humidity cabinet; scientific lamp-blown glassware; high vacuum pumping unit; all-glass water still; fractional distillation unit; "Dreadnought" glass pipe lines; streamline hydrometers and thermometers; volumetric glassware of guaranteed accuracy; laboratory stirrers and shakers; portable hot plates, and thermostat baths.

Reliability is essential if packings and jointings are to fulfil their functions adequately in modern engine and power plant. Specialists in the packing and jointing industry is JAMES WALKER & Co., LTD., "Lion" Works, Woking, Surrey (Stand No. D.430, Castle Bromwich) and a representative range of its "Lion" packings, jointings and moulded sealing rings are exhibited. A comparatively recent addition to the range, samples of which are available, is "Nebor," a bonded cork jointing, for which is claimed the advantages of cork with the resilience of rubber without affecting rigidity. It is approved by the Air Ministry for service in kerosene, ethylene, glycol, aviation fuel, and anti-freeze oil; it has good insulation and sound properties and should therefore be suitable for machinery mountings when used in thick blocks. It is also recommended for jointing, for it covers a wide range of applications, including steam, water, oil, spirits, alkalis, acids, emulsions, at all pressures and reasonable extremes in temperature.

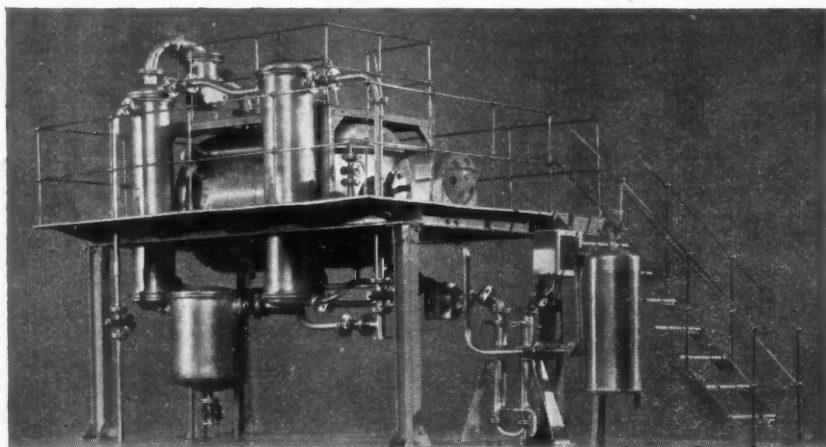
More recent applications of the firm's basic material, "Linatex" rubber, are indicated by WILKINSON RUBBER LINATEX, LTD., Camberley, Surrey (Stand No. D.501, Castle Bromwich). The "Linatex" pump, of which a 4 in. sand pump is exhibited, was designed by the South African Linatex organisation to overcome the expense of replacements and stoppages in mines owing to the short life of types previously in use. To prevent wear on metal surfaces, the rubber is used throughout the interior, and the



Synchronous process timer (Londex, Ltd.—Stand No. C.718, Castle Bromwich).

shrouded type impeller, composed almost entirely of the rubber, is designed to last years instead of weeks. The patented hydrostatic gland obviates the necessity for conventional gland packing. The "Linatex" ball mill, of which two types are on view, represents a new departure in ball mill construction which gives all the abrasion-resisting advantages of rubber without the weakness inherent in the bonding of linings. Rings of the rubber, held under compression, form the barrel and render metallic contamination of the contents impossible.

Working model of solvent recovery plant (London Aluminium Co., Ltd.—Stand No. D.224, Castle Bromwich).



At the B.I.F.**WHO'S WHO IN CASTLE BROMWICH SECTION**

The following is a list of firms exhibiting plant and accessories used by the chemical industry.

Acid Equipment

	Stand No.
B.T.R. Silvertown Group, London ...	D.615
Cannwing, W., & Co., Ltd., Birmingham	D.207, 106
Dunlop Rubber Co., Ltd., London ...	D.517
Enamelled Metal Products Corporation (1933), Ltd., London ...	D.743, 642
Girdlestone & Co., London ...	D.533
Gresham & Craven, Ltd., Salford ...	D.145
London Aluminium Co., Ltd., Birmingham	D.224
Meldrums, Ltd., Timperley ...	D.405, 304
Metal Processes, Ltd., Birmingham ...	D.227
Mirrieles, Watson & Co., Ltd., Glasgow ...	B.320
Morgan Crucible Co., Ltd., London ...	D.305, 204
Moseley, David, & Sons, Ltd., Manchester	D.640
Redfern's Rubber Works, Ltd., Hyde ...	D.110
St. Helens Cable & Rubber Co., Ltd., Slough	D.745
Sigmond Pumps, Ltd., Gateshead ...	D.337
Taylor Rustless Fittings Co., Ltd., Leeds	B.315
Wilkinson Rubber Linatex, Ltd., Camberley	D.501

Adhesives (Industrial)

B.B. Chemical Co., Ltd., Leicester ...	D.111
B.T.R. Silvertown Group, London ...	D.615
Bakelite, Ltd., London ...	C.504
Birkbys, Ltd., Liversedge ...	C.208
Celcon, Ltd., Kingston-on-Thames ...	B.527
Churchill, Charles, & Co., Ltd., Birmingham	D.724
Imperial Chemical Industries, Ltd. (Paints Division), Slough ...	D.214
Rawlplug Co., Ltd., London ...	C.703
Redfern's Rubber Works, Ltd., Hyde ...	D.110
St. Helens Cable & Rubber Co., Ltd., Slough	D.745
Spraytex, Manchester, Ltd. ...	B.219
Surridge's Patents, Beckenham ...	A.205
Titanine, Ltd., London ...	B.325

Aluminous Firebricks (Furnace)

Guest, Keen & Nettlefolds, Ltd., Birmingham	B.625, 526
Morgan, Crucible Co., Ltd., London ...	D.305, 204
P.B. Sillimanite Co., Ltd., London ...	C.620
Sankey, J. H., & Sons, Ltd., London ...	B.406
Stein, John G., & Co., Ltd., Bonnybridge	D.313

Ammonia Gas Scrubbers

Balfour, Henry & Co., Ltd., London ...	D.743, 642
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Annealing Pots

Foilsain Metals, Ltd., Luttworth ...	D.326
Russell, Samuel, & Co., Ltd., Walsall ...	D.119

Anti-Friction Metal

Delta Metal Co., Ltd., Birmingham ...	D.311
Heaton & Dugard, Ltd., Birmingham ...	D.311
Moore Bros., Ltd., Birmingham ...	D.311
Murex, Ltd., Essex ...	D.245, 144
Tin Research Institute, Greenford ...	D.141
Wickman, A. C., Ltd., Coventry ...	D.416

Belting

Angus, George, & Co., Ltd., Newcastle-on-Tyne	D.711
B.T.R. Silvertown Group, London ...	D.615
Dick, K. & J., Ltd., Glasgow ...	D.221
Dunlop Rubber Co., Ltd., London ...	D.517
Fenner, J. H., & Co., Ltd., Heckmondwike	D.605
Ferodo, Ltd., Stockport ...	D.733
Leon Leather, Ltd., Ashton-under-Lyne	D.127
Richardson, W. & J., Derby ...	D.735
Small & Parkes, Ltd., Manchester ...	D.317
Stephens Belting Co., Ltd., Birmingham	D.233
Terry, Herbert, & Sons, Ltd., Redditch	B.424
Wright's Ropes, Ltd., Birmingham ...	D.723

Boilers (Industrial)

	Stand No.
Arden Hill & Co., Ltd., Birmingham ...	C.519, 418
Babcock & Wilcox, Ltd., London ...	D.407, 306
British Gas Council, London ...	C.619, 518
Brockhouse Heater Co., Ltd., West Bromwich	D.405, 304
Clarkson Thimble Tube Boiler Co., Ltd., London	D.407, 306
Cochran & Co. (Annan), Ltd., Annan, Scotland	D.624
Crittall, Richard, & Co., Ltd., London ...	B.300
Danks, Edwin, & Co. (Oldbury), Ltd., Oldbury	D.407, 306
Davis Gas Stove Co., Ltd., London ...	C.519, 418
Fletcher, Russell, & Co., Ltd., Warrington	C.519, 418
Foster, Yates & Thom, Ltd., Blackburn ...	D.504
G.W.B. Electric Furnaces, Ltd., Dudley	C.317, 220
International Combustion, Ltd., London	D.331, 230, 239
Radiation Ltd., Birmingham ...	C.519, 418
Richmonds Gas Stove Co., Ltd., Warrington	C.519, 418
Spencer-Bonecourt, Ltd., London ...	D.407, 306
Stirling Boiler Co., Ltd., London ...	D.407, 306
Stott, James, & Co. (Engineers), Ltd., Oldham	C.727, 626
Thompson, John, Engineering Co., Ltd., Wolverhampton ...	D.519, 418
Wilsons & Mathiesons, Ltd., Leeds ...	C.519, 418
Wright, John, & Co., Ltd., Birmingham	C.519, 418

Coal Pulverisers

Babcock & Wilcox, Ltd., London ...	D.407, 306
British Jeffrey-Diamond, Ltd., Wakefield ...	D.526
International Combustion, Ltd., London	D.331, 230, 239

Compressors, Blowers and Pumps

Aerospray Manufacturing Co., Ltd., Birmingham	D.732
Aerograph Co., Ltd., London ...	D.302
Air Industrial Developments, Ltd., Shenstone	D.132
Allday, William, & Co., Ltd., Stourport-on-Severn ...	D.503
Armstrong Whitworth & Co., Gateshead-on-Tyne ...	D.231
Automatic Pumps, Ltd., Maidstone ...	D.501a
Balfour, Henry, & Co., Ltd., London ...	D.743, 642
Bivac Air Co., Ltd., Stockport ...	C.225
British Gas Council, London ...	C.619, 518
British Vacuum Cleaner & Engineering Co., Ltd., Leatherhead ...	D.203, 102
Bromak Pneumatic Paint Brush, Ltd., Croydon	B.704
Broughton, J., Birmingham ...	D.610
Chesterfield Tube Co., Ltd., Derbyshire	D.617, 516
Coleman & Appleby, Ltd., Birmingham	D.103
Cooke & Ferguson, Ltd., Manchester ...	C.109
Crittall, Richard & Co., Ltd., London ...	B.300
Flexibox, Ltd., Manchester ...	D.126
Foster, W. & J., Ltd., Preston ...	D.341
Gresham & Craven, Ltd., Salford ...	D.145
H.E.C. Compressors & Engines, Ltd., Birmingham ...	D.739, 638
Hymatic Engineering Co., Ltd., Redditch ...	D.137
Johnsons, C. H. (Machinery), Ltd., Stockport	D outdoor
Lincoati & Co., Ltd., London ...	C.229, 106
Martindale Electric Co., Ltd., London ...	C.229, 106
Matthews & Yates, Ltd., Manchester ...	D.705
Metropolitan-Vickers Electrical Co., Ltd., Manchester ...	C.510
Midland Fan Co., Ltd., Birmingham ...	A.622
Mirrieles, Watson & Co., Ltd., Glasgow	B.320
Siebe, Gorman & Co., Ltd., Tolworth ...	D.634
Spraytex Manchester, Ltd., Manchester	B.219
Winchester Engineering, London ...	C.102
Balfour, Henry, & Co., Ltd., London ...	D.743, 642
Birlec, Ltd., Birmingham ...	D.507, 406
Electric Furnace Co., Ltd., Weybridge ...	C.611
G.W.B. Electric Furnaces, Ltd., Dudley	C.317, 220
General Electric Co., Ltd., London ...	C.503, 402

Stand No.

Imperial Chemical Industries, Ltd. (Degreasing & Heat Treatment), London ...	D.315, 214
Wickman, A. C., Ltd., Coventry ...	D.416
Wild-Barfield Electric Furnaces, Ltd., Watford ...	C.317, 220

Filters

Air-Maze (Great Britain), Ltd., Patricroft ...	D.129
Aerospray Manufacturing Co., Ltd., Birmingham ...	D.732
Aerograph Co., Ltd., London ...	D.302
Aerox Productions, Ltd., London ...	D.429
Automotive Products Co., Ltd., Leamington Spa ...	D.426
Coleman & Appleby, Ltd., Birmingham ...	D.103
Cruickshank, R., Ltd., Birmingham ...	D.226
H.E.C. Compressors & Engines, Ltd., Birmingham ...	D.739, 658
Heather Filters, Ltd., London ...	B.300
International Combustion, Ltd., London ...	D.331, 230, 239
London Aluminium Co., Ltd., Birmingham ...	D.224
Matthews & Yates, Ltd., Manchester ...	D.705
Midland Fan Co., Ltd., Birmingham ...	A.622
Mills, L. N., & Co., Ltd., New Malden ...	A.426
Morgan Crucible Co., Ltd., London ...	D.305, 204
Permutit Co., Ltd., London ...	D.209, 108
Phillips Lamps, Ltd., London ...	C.609
Simmonds Aeroaccessories, Ltd., London ...	D.427
Traugher Filter Co., Ltd., Wolverhampton ...	D.631, 530
Winchester Engineering, London ...	C.102

Foundry Equipment

Armstrong Whitworth & Co. (Pneumatic Tools), Ltd., Gateshead-on-Tyne ...	D.231
Electromagnets, Ltd., Birmingham ...	C.605
Follisain Metals, Ltd., Lutterworth ...	D.326
Green, Richard, Ltd., Cradley Heath ...	C.604
Morgan Crucible Co., Ltd., The, London ...	D.305, 204
Pneuflec, Ltd., Birmingham ...	D.626
Rapid Magnetizing Machine Co., Ltd., The, Birmingham ...	C.409
Rubery Owen & Co., Ltd., Darlaston ...	D.717, 616
Salter, Geo., & Co., Ltd., West Bromwich ...	A.407, 306
Wright, Ernest N., Ltd., Wolverhampton ...	D.509, 408

Furnaces and Crucibles

Allday, William, & Co., Ltd., Stourport-on-Severn ...	D.503
Birce, Ltd., Birmingham ...	D.507, 406
British Gas Council, London ...	C.619, 513
Electric Furnace Co., Ltd., Weybridge ...	C.611
Ferro Enamels, Ltd., Wolverhampton ...	B.317
Follisain Metals, Ltd., Lutterworth ...	D.326
G.W.B. Electric Furnaces, Ltd., Dudley ...	C.317, 220
General Electric Co., Ltd., The, London ...	C.503, 402
Hyde, Silas, Ltd., Birmingham ...	C.723
Imperial Chemical Industries, Ltd. (Degreasing & Heat Treatment), London ...	D.315, 214
Metal Processes, Ltd., Birmingham ...	D.227
Morgan Crucible Co., Ltd., The, London ...	D.305, 204
Wild-Barfield Electric Furnaces, Ltd., Watford ...	C.317, 220

Gas Furnaces

Allday, William, & Co., Ltd., Stourport-on-Severn ...	D.503
Balfour, Henry, & Co., Ltd., London ...	D.743, 642
British Gas Council, London ...	C.619, 513
Electric Furnace Co., Ltd., Weybridge ...	C.611
Imperial Chemical Industries, Ltd. (Degreasing & Heat Treatment), London ...	D.315, 214
J. L. S. Engineering Co., Ltd., Birmingham ...	C.725
Morgan Crucible Co., Ltd., The, London ...	D.305, 204
Wilkes, A. H., & Co., Birmingham ...	D.503

Gas Heaters (Industrial)

Allday, William, & Co., Ltd., Stourport-on-Severn ...	D.503
British Gas Council, London ...	C.619, 513
De La Rue Gas Development, Ltd., London ...	C.325, 228
Rowell, J., & Son, Ltd., Newcastle-upon-Tyne ...	A.650
Salter, T. E., Ltd., Tipton ...	B.414
Wellington Tube Works, Ltd., Tipton ...	C.300
Wilkes, A. H., & Co., Birmingham ...	D.503

Gas Holders

Balfour, Henry, & Co., Ltd., London ...	D.743, 642
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Gas Purifiers

Balfour, Henry, & Co., Ltd., London ...	D.743, 642
Humphreys & Glasgow, Ltd., London ...	C.114
Oxley Engineering Co., Ltd., Leeds ...	C.416
Salter, Geo., & Co., Ltd., West Bromwich ...	A.407, 306

Gas Retorts

Balfour, Henry, & Co., Ltd., London ...	D.743, 642
Stein, John G., & Co., Ltd., Bonnybridge ...	D.313

Gas Washing Machines and Boilers

Balfour, Henry, & Co., Ltd., London ...	D.743, 642
Bolton Metal Products, Ltd., London ...	D.743, 642
Bradley & Company, Limited, Bilston ...	A.419
Dean, W. H., & Son, Ltd., Burnley ...	C.624
Economic Gas Boiler Co., Ltd., Burnley ...	C.421
Howarth, G. L., & Co., Burnley ...	C.323
Morley Products (Padiham), Ltd., Padiham ...	C.119
Press Caps, Ltd., London ...	C.736
Rowell, J., & Son, Ltd., Newcastle-upon-Tyne ...	A.650
Taylor & Wilson, Ltd., Accrington ...	A.406
Wallis & Co. (Long Eaton), Ltd., Nottingham ...	B.523
Weldall & Assembly, Ltd., Birmingham ...	B.402

Gauges

Alexander, George H., Machinery, Ltd., Birmingham ...	B.421
Birkbys, Ltd., Liversedge ...	C.208
Butro Jig & Engr. Co., Ltd., Wolverhampton ...	D.631, 530
Cooper & Sons (Sheffield), Ltd., Sheffield ...	A.420
Delapena & Son, Ltd., Cheltenham ...	D.236
Gent & Co., Ltd., Leicester ...	C.407
Gordon, James, & Co., Ltd., Stanmore ...	D.234
Herbert, Alfred, Ltd., Coventry ...	D.218
Jones, E. H. (Machine Tools), Ltd., London ...	D.612
London Metal Warehouses, Ltd., Thames Ditton ...	D.535
Mills Scaffold Co., Ltd., London ...	B.303, 202
Nash Tyzack Industries, Stourbridge ...	A.404
Peckers, Ltd., Doncaster ...	D.421
Rotherham & Sons, Ltd., Coventry ...	D.702
Simmonds Aeroaccessories, Ltd., London ...	D.427
Smiths Industrial Instruments, Ltd., London ...	D.727
Tomey, Joseph, & Sons, Ltd., Birmingham ...	D.703
Wickman, A. C., Ltd., Coventry ...	D.416
Winchester Engineering, London ...	C.102
Worsen Co., Ltd., The, Birmingham ...	D.424

Instruments (Industrial)

Birkbys, Ltd., Liversedge ...	C.208
British Gas Council, London ...	C.619, 513
Cooke, Troughton & Simms, Ltd., York ...	D.105
Counting Instruments, Ltd., London ...	D.238
Ether, Ltd., Birmingham ...	D.726
Ferranti, Ltd., Hollinwood ...	C.615, 514
Foster Instrument Co., Ltd., Letchworth ...	C.622
General Electric Co., Ltd., The, London ...	C.503, 402
Gent & Co., Ltd., Leicester ...	C.407
Gordon, James, & Co., Ltd., Stanmore ...	D.234
Herbert, Alfred, Ltd., Coventry ...	D.218
London, Ltd., London ...	C.718
Marconi Instruments, Ltd., St. Albans ...	D.505
Partridge, Wilson & Co., Ltd., Leicester ...	C.305
Record Electrical Co., Ltd., Altrincham ...	C.716
Runbaken Electrical Products, Manchester ...	C.724
Sigma Instrument Co., Ltd., Letchworth ...	C.321
Salter, Geo., & Co., Ltd., West Bromwich ...	A.407, 306
Sangamo Weston, Ltd., Enfield ...	C.412
Simmonds Aeroaccessories, Ltd., London ...	D.427
Smiths Industrial Instruments, Ltd., London ...	D.727

Jacketed Pans

Balfour, Henry, & Co., Ltd., London ...	D.743, 642
Butterfield, W. P., Ltd., London ...	A.503
Danks, Edwin, & Co. (Oldbury), Ltd., Oldbury ...	D.407, 306
Enamelled Metal Products, Corporation (1933), Ltd., London ...	D.743, 642
Harvey, G. A., & Co., Ltd., London ...	B.329

	Stand No.
Stott, James, & Co. (Engineers), Ltd., Oldham	C.727, 626
London Aluminium Co., Ltd., The, Birmingham	D.224
Thompson Bros. (Bilston), Ltd., Bilston	D.328

Moulds (Industrial)

E.M.B. Co., Ltd., West Bromwich	D.134
Finney Presses, Ltd., Birmingham	D.140
Hale & Hale (Tipton), Ltd., Dudley Port	D.609, 508
Herbert, Alfred, Ltd., Coventry	D.310
High Duty Alloys, Ltd., Slough	D.123
Lacrimold Products, Ltd., London	A.642
Morgan Crucible Co., Ltd., The, London	D.305, 204
T.M.A. Injection Moulding Machine, London	C.304a
Telsen Electric Co. (1935), Ltd., Manchester	C.721
Turner Brothers (Birmingham), Ltd., Birmingham	D.512
Wickman, A. C., Ltd., Coventry	D.416

Muffles

British Gas Council, London	C.618, 518
Morgan Crucible Co., Ltd., The, London	D.305, 204
P. B. Sillimanite Co., Ltd., London	C.620
Wild-Barfield Electric Furnaces, Ltd., Watford	C.817, 220

Oil Furnaces and Equipment

Allday, William, & Co., Ltd., Stourport-on-Severn	D.503
Crittall, Richard, & Co., Ltd., London	B.300
Foltsain Metals, Ltd., Lutterworth	D.326
Imperial Chemical Industries, Ltd. (Degreasing & Heat Treatment), London	D.315, 214
Morgan Crucible Co., Ltd., The, London	D.305, 204
Parker, Winder & Achurch, Ltd., Birmingham	B.610
Spiral Tube & Components Co., Ltd., Derby	D.706
Wild-Barfield Electric Furnaces, Ltd., Watford	C.817, 220

Plant and Apparatus for Water Conditioning

Aerox Productions, Ltd., London	D.429
Aqualux, Ltd., Birmingham	B.606
Bell, A., & Co., Ltd., Northampton	B.420
Crittall, Richard, & Co., Ltd., London	B.300
London Aluminium Co., Ltd., The, Birmingham	D.224
Permutit Co., Ltd., The, London	D.209, 108

Plant for Ammonia

Aerox Productions, Ltd., London	D.429
Balfour, Henry, & Co., Ltd., London	D.743, 642
Harvey, G. A., and Co., Ltd., London	B.329
London Aluminium Co., Ltd., The, Birmingham	D.224

Plant for Benzole

Balfour, Henry, & Co., Ltd., London	D.743, 642
Grazebrook, M. & W., Ltd., Dudley	D.140
Harvey, G. A., and Co., Ltd., London	B.329
London Aluminium Co., Ltd., The, Birmingham	D.224
Oxley Engineering Co., Ltd., Leeds	C.416

Plant for Chemicals

Aerox Productions, Ltd., London	D.429
British Jeffrey-Diamond, Ltd., Wakefield	D.526
Canning, W., & Co., Ltd., Birmingham	D.207, 106
Chemag Metal Colouring Co., Ltd., Birmingham	D.436
Enamelled Metal Products Corporation (1933), Ltd., London	D.743, 642
Flexibox, Ltd., Manchester	D.126
Foster, Yates & Thom, Ltd., Blackburn	D.504
Grazebrook, M. & W., Ltd., Dudley	D.140
Heymann, Harry, Ltd., Bradford	D.632
London Aluminium Co., Ltd., The, Birmingham	D.224
Marconi Instruments, Ltd., St. Albans	D.505
Meldrums, Ltd., Timperley	D.405, 304
Metal Processes, Ltd., Birmingham	D.227
Mirrlees, Watson Co., Ltd., Glasgow	B.320
Oxley Engineering Co., Ltd., Leeds	C.416
Permutit Co., Ltd., London	D.209, 108
Redfern's Rubber Works, Ltd., Hyde	D.110
Scott, George, & Son (London), Ltd., London	D.743, 642

	Stand No.
Taylor Rustless Fittings Co., Ltd., The, Leeds...	B.315
Thompson Brothers (Bilston), Ltd., Bilston	D.328
Thompson, John, Engineering Co., Ltd., Wolverhampton	D.519, 418
Wilkinson Rubber Linatex, Ltd., Camberley	D.501

Plant for Coal Handling

Babcock & Wilcox, Ltd., London	D.407, 306
Balfour, Henry, & Co., Ltd., London	D.743 642
British Vacuum Cleaner & Engineering Co., Ltd., Leatherhead	D.203, 102
Ewart Chainbelt Co., Ltd., Derby	D.511, 410
International Combustion, Ltd., London	D.331, 230, 239
Ley's Malleable Castings Co., Ltd., Derby	D.511, 410
Lockers (Engineers), Ltd., Warrington	D.502
Mastabar Belt Fastener Co., Ltd., Cleckheaton	D.708
Oxley Engineering Co., Ltd., Leeds	C.416
Strachan & Henshaw, Ltd., Bristol	D. outdoor
Thompson, John, Engineering Co., Ltd., Wolverhampton	D.519, 418
Vickers-Armstrongs, Ltd., London	D.205, 104
Wilkinson Rubber Linatex, Ltd., Camberley	D.501

Plant for Degreasing

Canning, W. & C., Ltd., Birmingham	D.207, 106
Coleman & Appleby, Ltd., Birmingham	D.103
Cruickshank, R., Ltd., Birmingham	D.226
Imperial Chemical Industries, Ltd. (Degreasing & Heat Treatment), London	D.315, 214
Metal Processes, Ltd., Birmingham	D.227
Partridge, Wilson & Co., Ltd., Leicester	C.305
Sealcrete Products, Ltd., London	B.614

Plant for Gas Works

Balfour, Henry, & Co., Ltd., London	D.743, 642
Birlec, Ltd., Birmingham	D.507, 406
British Jeffrey-Diamond, Ltd., Wakefield	D.526
British Vacuum Cleaner & Engineering Co., Ltd., Leatherhead	D.203, 102
Ewart Chainbelt Co., Ltd., Derby	D.511, 410
Foltsain Metals, Ltd., Lutterworth	B.326
Harvey, G. A., and Co., Ltd., London	B.329
Humphreys & Glasgow, Ltd., London	C.114
International Combustion, Ltd., London	D.331, 230, 239
Ley's Malleable Castings Co., Ltd., Derby	D.511, 410
Lister, R. A. & C., Ltd., Dursley	D.212
Lockers (Engineers), Ltd., Warrington	D.502
Morris, B. O., Ltd., Coventry	D.513
Oxley Engineering Co., Ltd., Leeds	C.416
Permutit Co., Ltd., The, London	D.209, 108
"Shetack" Pool Works, Ltd., London	A.638
Sigma Instrument Co., Ltd., Letchworth	C.321
Smith, Edward, Ltd., Tipton	C.300
Stewarts & Lloyds, Ltd., Birmingham	D.509, 408
Victoria Tube Co., Ltd., Tipton	C.300
Wellington Tube Works, Ltd., Tipton	C.300
Wilkinson Rubber Linatex, Ltd., Camberley	D.501

Plant for Ironworks

Ewart Chainbelt Co., Ltd., Derby	D.511, 410
Foltsain Metals, Ltd., Lutterworth	B.326
Ley's Malleable Castings Co., Ltd., Derby	D.511, 410
Lister, R. A. & C., Ltd., Dursley	D.212
Lockers (Engineers), Ltd., Warrington	D.502
Wellman Smith Owen Engineering Corporation, Ltd., The, London	D.312

Plant for Steelworks

Grazebrook, M. & W., Ltd., Dudley	D.140
Lister, R. A. & C., Ltd., Dursley	D.212
Permutit Co., Ltd., The, London	D.209, 108
Wellman Smith Owen Engineering Corporation, Ltd., The, London	D.312

Plant for Tar

Balfour, Henry, & Co., Ltd., London	D.743, 642
Harvey, G. A., and Co., Ltd., London	B.329
London Aluminium Co., Ltd., The, Birmingham	D.224
Oxley Engineering Co., Ltd., Leeds	C.416

Plastic Machinery

Stand No.

Bradley & Turton, Ltd., Kidderminster	D.237
Christy & Norris, Ltd., Chelmsford	D.403
Daniels, T. H. & J. Ltd., Stroud	D.310
Delapena & Son, Ltd., Cheltenham	D.236
E.M.B. Co., Ltd., West Bromwich	D.134
Edison Swan Electric Co., Ltd., The, London	C.604
Finney Presses, Ltd., Birmingham	D.140
Herbert, Alfred, Ltd., Coventry	D.310
Jones, E. H. (Machine Tools), Ltd., London	D.612
Kent, B. B., Ltd., London	C.734
Shaw, Francis, & Co., Ltd., Manchester	D.310
T.M.A. Injection Moulding Machines, London	C.304a
Wickman, A. C., Ltd., Coventry	D.416
Wild-Barfield Electric Furnaces, Ltd., Watford	C.317, 220

Presses (Power)

Bliss, E. W. (England), Ltd., Derby	D.603
Broughton, J., Birmingham	D.610
Camelinat & Co., Ltd., Birmingham	D.717, 616
Edwards, F. J., Ltd., London	D.411
Herbert, Alfred, Ltd., Coventry	D.310
Jones, E. H. (Machine Tools), Ltd., London	D.612
Rayne Foundry, London	B, outdoor
Taylor & Challen, Ltd., Birmingham	D.415
Turner Brothers (Birmingham), Ltd., Birmingham	D.512
Wilkins & Mitchell, Ltd., Darlaston	D.600

Tanks and Cylinders

Burman, R. H., Ltd., Birmingham	A.619
Butterfield, W. P., Wd., London	A.503
Harvey, G. A., and Co., Ltd., London	B.329

Glycerine from Sugar**German Process**

THE production of glycerine and other important substances from cheap sugars by hydrogenation is one of the interesting processes carried on at the I.G. Farbenindustrie A.G. plant at Hoechst am Main, details of which are contained in the C.I.O.S. report (Item 22, File XX-11; 1s. net). Sugar is dissolved in water, inverted with 0.5 to 1.0 per cent oxalic acid and then subjected to hydrogenation at 200°C. and 300 atmospheres pressure through a series of tubular reactors. Nickel on pumice is used as a catalyst. The product is filtered, cleared with charcoal and dried under a vacuum. It consists of the following: 40 per cent glycerine, 40 per cent propylene glycol, and 20 per cent hexahydric alcohol. It was used as a substitute for glycerin where its physical properties were suitable.

Among the many other processes carried on at the Hoechst works were two involving the reduction of crotonaldehyde—the first, giving butanol in good yield through full reduction with hydrogen in the gaseous phase with a copper catalyst, carried on a pumice at a temperature of 180 to 250°C.; the second, giving a good yield of butyric aldehyde in partial reduction, carried out in the liquid phase, at low temperatures of 20 to 30°C., over a nickel catalyst on pumice.

C

Stand No.

Hills Patent Glazing Co., Ltd., West Bromwich	B.611, 512
London Aluminium Co., Ltd., The, Birmingham	A.411, 310, D.224
Metal Processes, Ltd., Birmingham	D.227

Temperature Control Apparatus

Birkbys, Ltd., Liversedge	C.208
British Gas Council, London	C.619, 518
Ether, Ltd., Birmingham	C.726
Foster Instrument Co., Ltd., Letchworth	C.622
Gordon, James, & Co., Ltd., Stanmore	D.234
Magnetic Value Co., Ltd., London	B.300
Rheostatic Co., Ltd., The, Slough	C.500
Sperry & Co., Birmingham	C.617, 516
Wild-Barfield Electric Furnaces, Ltd., Watford	C.317, 220

Welding Machines

British Insulated Callender's Cables, Ltd., London	C.709, 608
Cooke & Ferguson, Ltd., Manchester	C.109
English Electric Co., Ltd., The, London	C.613, 512
Fusarc, Ltd., Gateshead-on-Tyne	C.705
Holden & Hunt, Ltd., Staffs	C.719, 618
Langley Alloys, Ltd., Buckinghamshire	D.241
Midland Saw & Tool Co., Ltd., The, Birmingham	B.228
Morgan Crucible Co., Ltd., The, London	D.305, 204
Murex Welding Processes, Ltd., Waltham Cross, Herts	D.245, 144
New Process Welders, Ltd., London	C.118
Phillips Lamps, Ltd., London	C.609
Quasi-Arc Co., Ltd., The, Bilston	C.315
Rubery Owen & Co., Ltd., Darlaston	D.717, 616
Sciaky Electric Welding Machines, Ltd., Slough	C.222
Stelmar, Ltd., London	C.110
Weldcraft, Ltd., Croydon	D.739, 638
Wickman, A. C., Ltd., Coventry	D.416

Indian Chemicals**Tariff Decision**

The Government of India has given its decision on the reports of the Tariff Board on proposals of protection by some industries. The claim for protection from the caustic soda and bleaching powder industries was accepted by the Tariff Board and subsidies recommended. The Government have decided to grant a subsidy to the Metturr Chemical and Industrial Corporation for caustic soda and bleaching powder provided that the company sells at a price not higher than imported materials. The Tariff Board points out that, since the selling price for liquid chlorine is still below the present-day selling price, no subsidy or protection is required for this.

With regard to the proposal by the Tariff Board for a subsidy to the antimony industry, the Government have decided to convert the existing revenue duty on antimony of 30 per cent *ad valorem* into a protective *ad valorem* duty at the same rate.

The aluminium industry's claim for protection which was agreed to by the Tariff Board will be the subject of further inquiry. Most protective duties on iron and steel came to an end on March 31.

A useful booklet has just been brought out by British Aluminium Co., Ltd, Salisbury House, London Wall, E.C.2.

FEBRUARY PRODUCTION

REDUCED CONSUMPTION OF CHEMICALS

NO overall improvement in production and stocks of key chemicals and non-ferrous metals is to be found in the monthly Digest of Statistics for April just issued by the Central Statistical Office. The figures in the following summary represent thousand tons.

A substantial improvement in stocks is shown in the figures for sulphuric acid and its constituents in February. Then stocks of acid were 71.9, 8.6 better than last February, sulphur stocks were 71.1, compared with 43.9, spent oxide 143.7 (131.3) and pyrites 71 (70). Production of acid amounted to 88.2 (99.0) and consumption was reduced from 104 the previous February to 85. Consumption of sulphur was 12.8 (14.1).

Chemicals and Fertilisers

Reduced consumption and fair stocks characterised the February figures for chemicals and fertilisers. Consumption of ammonia was reduced from 23.44 in 1946 to 19.44 and stocks fell only from 5.87 to 4.14. Disposals of phosphate rock for fertilisers were 11.0 less at 52.8, although industrial users took 0.8 more, and stocks were 108.6 (151.4) and 36.2 (8.5), respectively. Stocks of superphosphate and compound fertilisers rose from 63.9 last year to 141 and 203.1 to 262, respectively.

Non-Ferrous Metals

In the non-ferrous metal group a decline is apparent in production and stocks and consumption has been correspondingly limited. The record is carried only up to February, when production of virgin aluminium was 2.56, compared with 2.58 in 1946 and 2.74 a year before. Consumption was down to 6.9 as against 9.4 in 1945. Magnesium production remained at the low figure of 0.14, compared with 1.09 two years before.

Consumption of virgin copper fell sharply in February from 33.5 the previous month and 24.8 in February, 1946, to 13.0 and the reduction of consumption of virgin zinc to 11.6 was almost as marked. Very little change is shown in the use of zinc concentrates. The stock position of copper, which weakened so markedly between 1945 and 1946, became slightly firmer at 85.8, but zinc stocks fell from 116.4 to 40.8.

Consumption of lead was almost halved at the February figure of 9.0 and tin was also down from 2.86 to 2.15. Lead stocks then amounted to only 19.7, against 56.0 the previous February, and zinc supplies were 18.8, compared with 33.6.

Rising Imports

The import-export summary shows generally an upward trend in arrivals of ores and

metals. Imports of bauxite in March were 18.2 (9.5), aluminium slightly less at 0.12, copper 27.4 (11.4), lead 12.0 (7.1), tin, ore and concentrates 4.8 (4.3), steel ingots 19.9 (3.1), semi-finished steel 30.8 (21.1), and finished steel 5.5 (1.4). Iron ore imports were down to 463.6 (567.5) and pig-iron and steel scrap also arrived in much smaller quantities.

In the export field, aluminium and manufactures, tinned plates, tin blocks, etc., alone showed better trade, the aluminium group having improved from 28.8 last year to 67.7 last March and shipments of tinned plates were almost doubled at 14.2 in March. All categories of iron and steel with the exception of "other finished goods" showed a general decline in March—bars and rods 12.8 (22.2), plates and sheets 15.7 (36.5), shapes and sections 5.5 (13.5) and railway material 11.9 (38.7). Exports of ammonium sulphate and sodium compounds were approximately halved, compared with March 1946, at 12 and 17.2, respectively.

WORKS SHUT-DOWN AVERTED

NEXT week's threat of a wholesale shut-down in the Scottish steel industry has been averted by a firm promise by the Ministry of Fuel and Power of sufficient coal supplies to bridge the gap caused in pit production by the miners' holiday on May 5 and 6. As a result, thousands of steel workers who were faced with the possibility of an idle week will be at work at the Lanarkshire Steelworks, Motherwell, the Glegarnock works of Colvilles, Ltd., and the Steel Company of Scotland's works at Hallside.

In an official statement issued on May 2 the chairman of Colvilles, Ltd., Sir John Craig, stated that substantial supplies of coal have now been promised, and a full resumption would be made at the first two works, with a partial resumption only at Hallside. So far as the Dalzell Works, Motherwell, and the Blochairn Works, Glasgow, were concerned, the situation was unchanged, however, and because there was no fuel available these works would be idle. The Colville group's Clydebridge Works, Cambuslang, was not affected by the threatened closure.

Coal consumption at the various steelworks runs to about 15,000 tons a week, while the total stock in the week ending April 26 was only 3405 tons. Coal stocks at Scottish steelworks are much lower generally than those in England at the present time.

CHEMICAL AND DYESTUFFS TRADERS

Bulk Buying Condemned by Chairman

CONDEMNATION of bulk buying and centralised selling, with a warning of the serious implications for the industrial life of this country contained in the Industrial Organisation Bill, were features of the annual report of the chairman of the British Chemical and Dyestuffs Traders' Association, Mr. C. W. Lovegrove, at the annual general meeting of the Association at the Savoy Hotel, London, on Thursday, May 19.

Mr. Lovegrove thought it was the duty of every representative body of traders to draw attention to the almost irreparable harm which bulk buying and centralised selling schemes inflict on our well tried machinery for developing world trade. "Overseas trade," he added, "is a sphere of activity in which the merchant must inevitably lead the way and it is most fortunate for this country that export trade cannot be nationalised. We, who are engaged in trade, recognise the necessity for removing all unnecessary hindrances to the activities of British merchants, because it is only through the enterprise of the merchant that Britain can rebuild that valuable entrepôt trade which, in the past, contributed so largely to what is known as invisible exports."

He continued: "The Government has recently introduced the Industrial Organisation Bill, a measure which contains serious implications for the industrial life of this country. Whatever good intentions the sponsors may have had, the powers sought by the Bill could be used for the regimentation of industry with consequent restriction on individual effort. It behoves all industry to follow this measure with the utmost vigilance . . ."

Mr. Lovegrove revealed that prolonged discussions were held with the Board of Trade during the year on the question of the distribution of German dyestuffs imported on Government account. The decision that required merchants to obtain their supplies through the British dyestuffs makers did not receive the agreement of the Association, and it asked for, and received, an assurance that the arrangements would not be regarded as a precedent for the method of handling other materials which it may become necessary for the Government to import. In submitting its objections to the Board of Trade the Association maintained that the merchant was well able to render the technical services which the Board of Trade regarded as so necessary for handling these dyestuffs.

With regard to controls, Mr. Lovegrove said that the organised handling of foreign government orders for toluene, xylol, and

solvent and heavy naphthas had served its purpose. He suggested that this business should now revert to the ordinary channels of trade.

Mr. Lovegrove intimated that a application had been made by the Association for a reduction in the rate of duty on imported whiting. So far the Board of Trade had not reached a decision in the matter.

Following the chairman's report and approval of the accounts, the following officers were elected:

President: Mr. Victor Blagden (re-elected); vice-presidents, Mr. G. S. Bache (re-elected) (James Beadel & Co., Ltd.), Mr. A. F. Lawson (re-elected) (Jensen, Lawson & Co.); chairman, Mr. A. Nash (formerly hon. treasurer) (Hughes & Hughes, Ltd.); vice-chairman, Mr. C. W. Lovegrove (Charles Page & Co., Ltd.); hon. treasurer, Mr. C. H. Wilson (Cole & Wilson, Ltd.); executive council, Mr. C. M. Bell (re-elected) (Chas. Zimmerman & Co., Ltd.), Mr. C. C. Hallett (Witco Chemical Co., Ltd.), Mr. J. D. Orr (James Miller Son & Co., Ltd.), Mr. J. F. A. Segner (re-elected) (Frank Segner & Co., Ltd.), Mr. C. N. Stafford (C. Tennant Sons & Co., Ltd.), Mr. D. F. Waugh (Tar Residuals, Ltd.).

After the annual general meeting nearly 200 members and guests had luncheon at the Savoy Hotel. The principal guests were: Air Vice-Marshal Donald Bennett, chairman, United Nations Association; Mr. L. P. O'Brien, chairman, A.B.C.M.; Mr. R. B. E. Jackson, president, P.M.A.T.A.; Major T. Knowles, Coal Tar Controller; Mr. F. S. Fairfield, Director for Sundry Materials; Mr. E. Mackenzie Hay, president, British Federation of Commodity and Allied Trades Association; Mr. J. Davidson Pratt, director and secretary, A.B.C.M.; Dr. G. M. Bennett, the Government Chemist; Mr. C. H. Hulse, secretary, Dyestuffs Control; Mr. R. D. Fennelly, Board of Trade; Mr. G. Gillie Shuck, Paint Directorate, and Mr. Charles O'Connor, president of Reichhold Chemicals Inc.

Dyeworks Fire

Fire at the White Hall bleach and dye works, Chinley, on April 28, destroyed the part of the building occupied by John Welch & Sons, Ltd. Goods being manufactured for export and for exhibition at the British Industries Fair were destroyed. The fire is believed to have been caused by the spark from an electric fan and the flames were fanned by a strong wind. Six brigades from neighbouring districts were called.

Coal Allocations

THE basis on which it is proposed to allocate coal to industry this summer (June 1 to October 31) was announced by the President of the Board of Trade (Sir Stafford Cripps) in the House of Commons last week.

Sir Stafford said: "The Government have carefully considered what supplies of coal can be allocated to industry over the summer months from June 1 onwards. The full stock-building programme to power stations, gas works and other consumers as already announced will be carried out. While the manpower position in the mining industry has shown improvement since the statement I made during the debate on the economic situation on March 10, there is a clear risk in planning allocations to industry at a higher level than I then indicated, in view of the uncertainty which must remain concerning output during the summer. On the other hand, the Government cannot fail to be impressed by the fact that supplies at such a level would not only cause industrial dislocation during the summer, but would also create shortages of materials and components which must seriously prejudice the operation of industry throughout next winter.

"Following consultation with both sides of industry, therefore, the Government have decided that supplies of coal to each industry between June 1 and October 31 shall be planned at a level equal to consumption during the summer of last year, subject to appropriate adjustments for factories newly started up, and for oil conversion, etc. In the case of the building materials industries, where there has been an exceptional expansion since last summer, an extra allocation will be made which will cover a proportion of the new production started since last summer. This extra allocation should enable these industries to obtain about 85 per cent of their current solid fuel requirements. In general, this will mean that supplies to individual firms will be based on the same rate of consumption as last summer. It will be for firms to build up, from the deliveries they receive, a stock sufficient to meet three weeks' winter requirements by the end of October. If larger stocks are accumulated, these will not be taken into account in framing the winter allocations. If firms fail to accumulate a three weeks' stock, the winter allocations will, nevertheless, be based on the assumption that such a stock is, in fact, held.

According to the Brazilian Ministry of Finance, in the January-June period of 1946 Brazil imported 944 metric tons of sodium chromate worth \$317,000. Of this amount the United States supplied 820 tons valued at \$241,000.

Chromic Acid Stocks

SOME prospect of improvement of supplies of chromic acid, which has been inadequate since the beginning of the year, is held out in a statement issued this week by the British Non-Ferrous Metals Research Association. The acute shortage originates in the first place from the strike in January at the Glasgow works of Messrs. J. and J. White, Ltd., where the acid is produced, and almost as soon as this was settled production was again interrupted by the fuel cuts.

Reviewing the prospects of renewed supply and means of conserving what is now available the British Non-Ferrous Metals Research Association says: We understand from the Board of Trade that the supply position is being dealt with; meanwhile all exports of chromic acid and of bichromate, from which the chromic acid is made, are being held up so that all the output shall be available for the home trade.

Supplies of the necessary raw materials have now been arranged and we are informed that from the beginning of next month the manufacturers hope to be producing over three-quarters of their normal output, and that the output may very shortly be brought up to normal. As all stocks have been used up and it is estimated that it will probably be three months before supplies become normal, firms are urged not to order in excess of their requirements.

The secretary of the Metal Finishing Committee of the Ministry of Supply, Mr. L. W. Owen (Room 1033, Shell Mex House, Strand, W.C.2) is considering the question of the best methods of conserving chromic acid and hopes shortly to issue a revised version of their Memo No. 1 on this subject.

STATUS OF FOREMEN

The Association of Supervisory Staffs, Executives and Technicians has just published a pamphlet under the title of "A National Charter for Supervisors and Technicians," which demands that all supervisors employed in industrial undertakings should be paid a minimum salary of £500 per annum. The contention is made that the majority of foremen are being underpaid.

The Association demands the recognition of the supervisory and technical workers as a key factor in industrial organisation and says that in some firms the prestige of the supervisor has been lowered by shop stewards and higher management reaching decisions without any consultation with the supervisory staffs.

The death has occurred in a Glasgow nursing home on April 27 of Mr. JOHN STRANGE, late managing director of Sun shine Bleach (Hillington), Ltd., who lived at 31 Glencorse Street, Carnitryne, Glasgow

TEXAS EXPLOSION

Monsanto's Report: Not Due to Plant Defect

From Our New York Correspondent

IN a report sent this week to all stockholders and employees of the company, Edward M. Queeny, board chairman of the Monsanto Chemical Company, revealed that the blast effect of atomic bombs at Hiroshima and Nagasaki may have been less severe than that suffered by parts of the Monsanto plant at Texas City, Tex. The report is based upon personal inspection of the blast site made by Mr. Queeny in company with William Rand, Monsanto's president. Of the 451 employees on duty at the plant at the time of the blast, the report states, 154 were either killed or are missing, more than 200 required hospitalization and 95 of the more seriously injured are still hospitalised.

Members of the plant's technical staff known to have been killed are: Charles Comstock, the division's technical director; B. F. Merriam, chief plant engineer; R. E. Boudinot, production manager; R. D. Sutherland, safety engineer, and F. A. Ruecker, chief power plant engineer, together with all members of his staff. The plant and contents were insured by Monsanto for \$14,750,000, which covered the plant inventory of approximately 1 million dollars and the depreciated value of its buildings, machinery and equipment on a 90 per cent co-insurance clause.

The report pointed out that the Texas City operation was not considered a hazardous one, any more than oil refining. No construction faults in the plant's design were accountable for the disaster, and the same type of construction will be used in rebuilding. In correcting erroneous statements that have been circulated about the disaster, Mr. Queeny said that the company does not manufacture ammonium nitrate, nor was it being loaded at the company dock, nor was it destined for any company plant, since Monsanto does not use it. He added that the Texas City plant did not use or manufacture any explosives, although it did use inflammable products such as benzol and propane.

Monsanto's greatest financial loss will be from the potential profits from several styrene derivatives which the company planned to manufacture, and which must now await either the rebuilding of the Texas City plant or the securing of styrene monomer supplies from other sources. "We are actively exploring every avenue," Mr. Queeny's report states. "We are hopeful of securing a substantial supply, but it is not likely that we can purchase enough to carry on with our recent programme."

U.S. Synthetic Exports

A review of the volume of United States foreign trade in 1946 reveals that during the year 69,076 long tons of GR-S (general purpose synthetic rubber), 496 tons of butyl, 2642 tons of neoprene, and 797 tons of N-types, a total of 73,011 tons, were exported from the country under allocations from the United States. Comparable figures for 1945 were 62,833, 1029, 5852, and 357, a total of 70,071. France took 36 per cent of the GR-S exports, the United Kingdom 18 per cent, Italy 9 per cent, Belgium 5 per cent, and Argentina, Spain and Mexico between 3 and 4 per cent. Of the butyl, Mexico took 60 per cent of the U.S. exports and Cuba 22 per cent. Thirty-eight per cent of the neoprene shipments went to Canada, 30 per cent to France, and 8 per cent to the United Kingdom. In the division of N-type exports, France took 52 per cent and no other country took a significant quantity. Officials of the United States Department of Commerce predict only dwindling exports of synthetic rubber in 1947.

New Resin Plant

A new plant for the manufacture of chemicals was officially opened this week at Burlington, N.J., by Dr. W. M. Billing, general manager of the synthetics department of the Hercules Powder Co. The first unit of the plant to be brought into production this week was the one for the manufacture of pentaerythritol resins and it is planned to shortly place in operation units for the manufacture of liquid resins, rosin esters, and hydroabietyl alcohol. The plant is expected to be in full production by the end of this summer.

The firm's pentalyn resins are used in adhesives, wax polishing compounds, and in the manufacture of rubber. The liquid resins, Hercolyn and Abalyn, are used chiefly in adhesives, plastics, and textiles. The rosin esters are used in textile coatings and sizings, coatings, adhesives and plastics. Hydroabietyl alcohol, a resin alcohol, is a new chemical and is intended for use in the manufacture of synthetic resins and has possibilities in applications such as protective coatings, plastics and textile finishes.

Detergents and Instruments in German Laundries

THIS report, B.I.O.S. Final Report No. 711, "Interrogation of Dr. Hans Albrecht Kind of Bohme Fettchemie und Henkel & Cie, Dusseldorf," is issued with the warning that should the subject matter be covered by British and/or U.S. patents or patent applications, this publication cannot be claimed to give protection against action for infringement. It deals with a number of German laundering methods and also provides details of some of the synthetic washing compounds used in that industry.

A scheme was in operation in Germany whereby a laundry complying with a strict code of rules could obtain an "Approved Laundry" mark or "Gutezeichen," but very few laundries ever attained the high standard required. To obtain this certification, laundries had to use soft water and the plant was required to be open to inspection by a chemist of one of the two laundry associations; it was also necessary for the laundry's washing machines to be fitted with thermometers, depth gauges, and enclosed steam heating units. The quality of its processes was checked by regularly laundering certain fabrics, and the tensile strength, degree of whiteness, and ash content of the materials were measured after fifty washes. As an example of the standard required, it was stipulated that bleached cotton should retain a degree of whiteness of 85 per cent with a loss in tensile strength of not more than 20 per cent. Further details are given in the report of the tensile figures required for other types of fabrics.

Use of Synthetics

The use of synthetic detergents was in general encouraged for both performance and economic reasons. They are insensitive to lime, and hard water does not affect their detergent properties. They are easily soluble in water at all temperatures and are stable against acids. They have a high foaming power, and their dirt suspension power is less than that of soap. Synthetic detergents are easily rinsed out whereas soap is somewhat difficult to remove from the fabric fibres. From a given quantity of fat a greater yield of detergent, such as sulphated fatty alcohol, can be obtained compared with the yield of soap. Soap is always alkaline and thus the sulphated fatty alcohols, which are neutral in solution, are more suitable than soap for the washing of woollen goods and fine fabrics. Weight for weight, sulphated fatty alcohols will deal with a larger quantity of clothing than the same weight of soap. Although this class of synthetic detergent suffers from the disadvantage of being expensive to manufac-

ture, yet their efficiency is such that, in the aggregate, it proves more economical to use such materials in preference to soap.

In this country sodium carbonate is the material used for general household water-softening purposes, whereas the German housewife normally employs a mixture of waterglass and sodium carbonate. Sodium metasilicate is also used to some extent but it is not recommended for use with hard water.

For bleaching purposes hydrogen peroxide appears to be used in preference to hypochlorites. This preference for peroxide, or bleaches based on peroxide, is apparently due to the fact that hypochlorites are generally associated with a somewhat disagreeable odour.

Composition of Washing Powders

Some details are given in the report concerning the composition of various washing powders and modified soaps which were sold both during the war and also prior to the outbreak of hostilities. Sodium hexametaphosphate is employed in some laundries for first rinses where the water is hard, but the use of sodium sesquicarbonate was apparently unknown in the German laundering industry prior to the occupation. The U.S. authorities however supplied German laundries with this material for U.S. service washing purposes.

Two appendices in the report deal with synthetic washing compounds and these should be of some interest to the British laundering industry. Numerous classes of synthetic detergents were manufactured and the report gives the following list of types: sulphated fatty alcohols, condensations products of fatty acids, benzimidazol derivatives, monoglyceride sulphonates, ethylene oxide products, salts of alkylsulphonic acids.

It should be noted that the last two groups are based neither on synthetic nor on natural fats.

Some information is given regarding the manufacture of mersolate, but more comprehensive information on this product has been published elsewhere (B.I.O.S., Report No. 805).

The appendix devoted to "Sequeron" gives a few details of this material which, it is stated, is a mixture of sodium salts of the higher alkyl monosulphuric esters, with the general formula $C_nH_{2n+1}SO_3Na$, and the sodium salts of the higher alkyl sulphonic acids, which have the general formula $C_nH_{2n+1}SO_3Na$. Sequeron is supplied in both flake and paste form, both types having the same composition and properties and differing only in bulk density.

PRODUCTION OF ALUMINA BY THE LIME SODA PROCESS—IV*

Extraction of Alumina from Shale

by W. E. PRYTHERCH, M.Sc., F.R.Ae.S.; M. L. R. HARKNESS, B.Sc.,
and W. D. SPENCER, Ph.D., F.R.I.C.

FROM a consideration of the chemical composition of shale, the relatively high silica and low iron contents suggest that an acid extraction might prove more successful than an alkaline one. This did not prove to be the case in practice. Attempts to extract the alumina with hot, concentrated sulphuric acid resulted in very poor extractions of the order of 10 per cent. Preliminary experiments with the lime-soda process gave such promising results that it was decided to investigate the process in detail. Many of the attempts to extract with acid gave interesting results however, and it was thought worth while to devote some space to them.

Numerous samples of shale were available for experimental purposes, particulars of which are quoted in the following table. The figures quoted are all calculated on the ash. All these samples are from South Wales' collieries except St. Helens which is in Cumberland.

Blaenavon shale was selected owing to its fairly high alumina content. In view of the low iron oxide and high silica content of shale it might be thought that it would be most readily amenable to acid treatment. In our experience, however, the alumina in shale is not soluble in acids to any great extent, even after preliminary calcination.

Experiments were first carried out using direct attack with excess hot sulphuric acid of various concentrations and the following results obtained:

Concentration of Sulphuric Acid

(by weight)

5 per cent

10 " "

15 " "

20 " "

Percentage Extraction of Alumina

3.6 per cent

3.8 " "

4.3 " "

9.4 " "

TABLE 27

Source of sample	Ash per cent.	SiO ₂ per cent.	Al ₂ O ₃ per cent.	Fe ₂ O ₃ per cent.	Mn ₂ O ₄ per cent.	TiO ₂ per cent.	CaO per cent.	MgO per cent.	P ₂ O ₅ per cent.	SO ₂ per cent.
Blaenavon ...	70.20	52.33	36.17	4.51	0.11	1.06	1.08	1.37	0.19	0.71
Glyncastle ...	73.50	52.39	30.67	7.62	0.22	0.92	1.55	2.38	0.22	0.86
Gwaun Cae Gurwen ...	82.40	56.87	28.87	6.24	0.11	1.06	0.79	1.94	0.24	0.36
Parc ...	71.70	59.52	26.20	5.17	0.12	1.20	0.65	1.65	0.22	0.48
Nine Mile Point ...	73.60	54.10	33.05	5.33	0.10	1.26	0.75	1.55	0.18	0.39
Penallta ...	63.00	54.86	33.60	3.72	0.11	1.03	0.60	1.59	0.16	0.32
Taff Merthyr ...	75.20	53.72	35.34	3.51	0.04	1.09	0.62	1.26	0.19	0.25
Tirpentwys ...	77.30	53.02	33.28	4.46	0.06	1.33	1.52	1.40	0.19	0.66
Tymawr ...	77.00	58.02	29.26	5.20	0.14	1.17	0.49	1.26	0.20	0.19
Tower ...	69.50	53.30	31.89	5.85	0.09	1.18	1.64	1.73	0.19	0.76
Cwm ...	85.20	56.43	20.90	6.50	0.15	1.04	0.38	1.40	0.18	0.08
Elliot ...	68.90	55.28	32.89	4.41	0.05	1.16	0.63	1.18	0.17	0.16
Llanharan ...	63.60	41.08	24.53	19.72	—	0.62	2.71	2.79	0.47	1.32
St. Helens I ...	50.65	58.54	35.12	2.08	—	0.82	0.71	—	—	—
St. Helens II ...	48.17	56.50	37.08	3.84	—	1.07	0.98	0.14	—	—
St. Helens III ...	53.11	55.20	40.66	0.88	—	0.94	0.38	0.74	—	—

It will be observed that the compositions vary considerably. From the point of view of extraction of alumina the important constituents are alumina, silica and iron oxide, the others having relatively little effect on any of the processes normally employed for alumina extraction. Since it was obviously too large a task to experiment with all these samples at once, it was decided to select a shale and use it for all the experiments, and then, when a satisfactory process had been established, to test the various samples of shale received.

Similar results were obtained using china clay and foundry dross and though the yields were somewhat higher with the dross (of the order of 40 per cent extraction), they were not good enough to warrant further attention. With very concentrated acid, the effect is to reduce the material to a gelatinous mass, which imbibes a large quantity of the solution, thus considerably reducing the efficiency, and causing filtration difficulties.

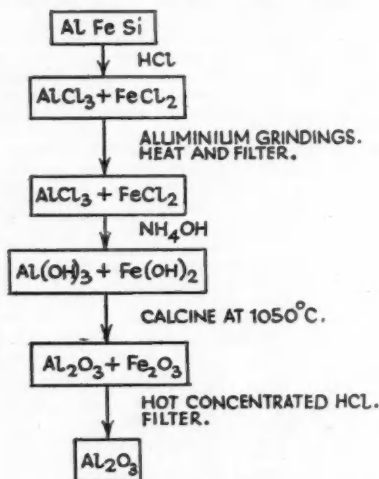
As has been discussed previously, it is possible to produce aluminium-ferro-silicon from shale. The approximate theoretical composition would be aluminium 38.8 per cent, iron 7.4 per cent, silicon 53.8 per cent.

* Previous articles appeared on January 25, February 8 and March 22.

A considerable amount of work was done on the extraction of aluminium from aluminium-ferro-silicon by direct attack with (a) acids, and (b) alkalis.

Aluminium-ferro-silicon of composition, aluminium 32 per cent, iron 10.60 per cent, silicon 49 per cent ground through 150 mesh, was used for the following experiments:

Direct attack with acids resulted in solution of the aluminium and iron which had then to be separated. Difficulty was experienced in the initial stages of these processes as the percentage extraction of alumina was poor. Using dilute acids, extractions of the order of 30 per cent were obtained, and



with concentrated acid, approximately 50 per cent. If the acid concentration was more than about 5 per cent (by weight), the whole mass became gelatinous, owing to the formation of silicic acid. Another difficulty was caused by the formation of spontaneously inflammable silicon hydride.

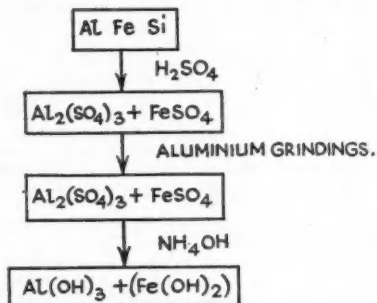
Solution of aluminium-ferro-silicon is difficult because of the complex structure of the alloy, the aluminium being present as complex compounds. According to Takeda and Mutinzaki⁴³ six ternary compounds of aluminium, iron and silicon are known.

Using alkaline attack, better results were obtained. It was found that by treating Al.Fe.Si with dilute caustic soda solution and keeping the mixture cool (not > 30°C.), reasonably good extraction of aluminium could be obtained. There was a strong tendency for the silica to become oxidised and dissolve but eventually this was overcome by the use of an inhibitor; thus about 70 per cent of the available aluminium could be extracted. Alumina was precipitated from

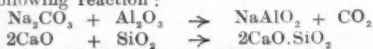
the sodium aluminate solutions, either by passing in CO₂ or by seeding. Both methods proved satisfactory, though seeding is preferred for economic reasons. Seeding, however, demands carefully controlled conditions, since precipitation will only take place if the ratio Na₂O/Al₂O₃ is kept within definite limits.

The alumina produced by this method contained no iron and approximately 0.6 per cent silica. This is considered excessive for the production of aluminium and a desilicating process would have to be employed; this will be discussed later.

The lime-soda process depends on the for-



mation of soluble sodium aluminate and insoluble dicalcium silicate according to the following reaction:



the aluminate being rendered soluble as sodium aluminate. At least one molecule of soda to one of alumina and two molecules of lime to one of silica are required.

If the reaction is to be carried out in the liquid phase it is conceivable that the theoretical quantities would be sufficient. According to Kammermeyer and White,⁴⁴ in a very comprehensive thesis on the production of alumina by the lime-soda process, increasing yields are to be obtained at higher temperatures, and they suggest that if the mixture were to be fused in an electric furnace, yields of over 90 per cent would be obtained. This has not been our experience however. Maximum yields have been obtained with shale at temperatures between 1000°C. and 1100°C. with a definite decrease in the yield at higher temperatures. This is confirmed by Strokov⁴⁵ who states that the formation of sodium aluminate by fusion of sodium carbonate and alumina is complete at 1000°-1100°C., and that the products begin to dissociate at 1200°-1300°C. The temperature should not be below 1000°C. since it is at 1000°C. approximately that the lime reacts with the silica to form dicalcium silicate.

A charge was heated in a high frequency

furnace keeping the input of energy constant and the temperature of the charge was measured every minute using a Pt-Rh thermocouple inserted in the charge. The results indicate clearly that the endothermic reaction

$\text{Na}_2\text{CO}_3 + \text{Al}_2\text{O}_3 \rightarrow 2\text{NaAlO}_2$
takes place at approximately 760° and the exothermic reaction

$2\text{CaO} + \text{SiO}_2 \rightarrow 2\text{CaO} \cdot \text{SiO}_2$
takes place about 960°C . These temperatures agree with the published data for these reactions.

At 1050°C . a charge of powdered shale, calcined lime and sodium carbonate just sinters and does not show signs of melting. This is a great advantage as it means that it is an easier product to leach. Since it is a sintering operation it is essential to have the constituents of the charge intimately mixed before furnacing. The shale, sodium carbonate and lime should all be ground through an 85 mesh (B.S.S.) before the charge is mixed. If theoretical quantities of lime and sodium carbonate are used it is obvious that the mixing must be 100 per cent efficient, since each molecule of silica must come into contact with a molecule of lime, and even with thorough mixing this is not likely. On the other hand it is not advantageous to depart far from the theoretical quantities, as, when lime is present in excess it combines with some of the alumina to render it insoluble, and when lime is deficient the excess silica combines with alumina to give $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$, which is also insoluble.

Experiments were carried out on Blaenavon shale ash using varying quantities of sodium carbonate and lime. The constituents of each charge were ground through an 85 mesh before mixing. The charge was thoroughly mixed and then transferred to a platinum crucible and heated for an hour at 1050°C . The charge was then leached with water, and the alumina precipitated by passing carbon dioxide into the sodium aluminate solution. The yields of alumina, the recovery of sodium carbonate and the percentage silica in the resulting alumina were noted in each case. Each experiment was done in duplicate to ensure that the technique adopted gave reproducible results.

The results obtained are shown in Table 28 where it will be seen that a fairly large excess of sodium carbonate must be used if good yields are to be obtained. This is not the case if other aluminiferous materials are used, such as aluminium dross, where it was found possible to work with 1.1 molecules sodium carbonate to 1 molecule alumina and obtain yields of the order of 76 per cent.

It has been found possible to work with less than 2.5 molecules lime to 1 molecule silica, but only by grinding the charge more finely. Working with materials ground

through 150 mesh and ensuring thorough mixing, good yields of alumina, containing very little silica, were obtained, but it would probably not be advantageous to do this in practice since lime is not expensive, and, in any case, if the residues from the process are to be used in the manufacture of Portland cement, further lime must be added at a later stage.

Experiments were next carried out replacing the sodium carbonate in the fusion mixture with other sodium salts. Sodium chloride was added in the ratio 2 molecules sodium chloride to 1 molecule alumina but the reaction did not proceed well and only 19 per cent yield of alumina was obtained. More successful results were, however, obtained with sodium sulphate.

TABLE 28

Composition of charge	Yield of Al_2O_3 per cent.	SiO_2 in Al_2O_3 per cent.	Na_2CO_3 recovered per cent.
10 gms. shale ash. 12.6 gms. lime. 3.7 gms. Na_2CO_3 (1 mol. $\text{Na}_2\text{CO}_3 = 1 \text{ mol. Al}_2\text{O}_3$)	11.5	0.06	23.0
10 gms. shale ash. 12.6 gms. lime. 4.5 gms. Na_2CO_3 (1.2 mols. $\text{Na}_2\text{CO}_3 = 1 \text{ mol. Al}_2\text{O}_3$)	12.4	0.12	28.0
10 gms. shale ash. 12.6 gms. lime. 5.25 gms. Na_2CO_3 (1.4 mols. $\text{Na}_2\text{CO}_3 = 1 \text{ mol. Al}_2\text{O}_3$)	34.0	0.13	39.0
10 gms. shale ash. 12.6 gms. lime. 6.0 gms. Na_2CO_3 (1.6 mols. $\text{Na}_2\text{CO}_3 = 1 \text{ mol. Al}_2\text{O}_3$)	37.0	0.15	39.0
10 gms. shale ash. 12.6 gms. lime. 6.8 gms. Na_2CO_3 (1.8 mols. $\text{Na}_2\text{CO}_3 = 1 \text{ mol. Al}_2\text{O}_3$)	50.0	0.13	50.0
10 gms. shale ash. 12.6 gms. lime. 7.5 gms. Na_2CO_3 (2 mols. $\text{Na}_2\text{CO}_3 = 1 \text{ mol. Al}_2\text{O}_3$)	49.0	0.19	45.0
10 gms. shale ash. 12.6 gms. lime. 8.3 gms. Na_2CO_3 (2.5 mols. $\text{Na}_2\text{CO}_3 = 1 \text{ mol. Al}_2\text{O}_3$)	65.0	0.16	57.0
10 gms. shale ash. 12.6 gms. lime. 10 gms. Na_2CO_3 (3.0 mols. $\text{Na}_2\text{CO}_3 = 1 \text{ mol. Al}_2\text{O}_3$)	76.1	0.16	80.1

According to the literature,⁴⁶ by treating the optimum mixture of bauxite, Na_2SO_4 and limestone in the presence of superheated steam, products are formed from which 90 per cent of the Al_2O_3 originally present can be extracted. This process is based on patents held by the German Renania plant and the Norwegian Aluminium Company.

Martin, in an early patent,⁴⁷ states that the addition of sodium sulphate to a lime-soda sinter mixture lowers the melting point of the material and considerably increases the yield of alumina. In our experience the melting point of the mixture was lowered,

but decreased yields of alumina were obtained. The fusions were carried out using Blaenavon shale ash of composition: Al_2O_3 36.17 per cent, SiO_2 52.33 per cent, Fe_2O_3 4.61 per cent. The lime content of the fusion mixtures was kept constant, at the ratio $2\frac{1}{2}$ molecules CaO to 1 molecule Al_2O_3 . The ratio of Na_2SO_4 to Al_2O_3 was varied and a series of results obtained.

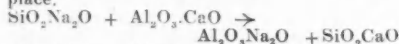
In each experiment 10 gms. shale ash were fused with lime and sodium sulphate for 1 hour at 1050°C ., all the constituents being ground through an 85 mesh (B.S.S.) and thoroughly mixed before fusion. The mixture was then ground through an 85 mesh again and leached with water. The alumina went into solution and was recovered by precipitation with CO_2 . The following results were obtained:

TABLE 29

	Mols. Na_2SO_4 / Al_2O_3	Al_2O_3 extracted per cent.	SiO_2 in Al_2O_3 per cent.
1	1.1	8.3	0.30
2	1.2	16.7	0.21
3	1.4	30.0	0.12
4	1.6	33.0	0.30
5	1.8	40.0	0.50
6	2.0	55.0	0.94
7	2.5	31.5	>1.00
8	3.0	29.0	≥ 1.00

It can be seen from these results that the yields of alumina obtained by using Na_2SO_4 compare unfavourably with those obtained with Na_2CO_3 . It does not seem possible to increase the yields further, since the graph showing $\text{Na}_2\text{SO}_4/\text{Al}_2\text{O}_3$ against yields of Al_2O_3 reaches a maximum at 2 molecules Na_2SO_4 to 1 molecule of alumina and then falls again.

The percentage silica in the alumina rises as the quantity of Na_2SO_4 is increased, and compares unfavourably with the purity of the alumina obtained using Na_2CO_3 . The fact that the percentage silica is higher in 1 and 2 than 3 is due to the very low yields of alumina, which obviously caused the percentage of SiO_2 in Al_2O_3 to rise, though the weight of SiO_2 dissolved is not higher in 1 and 2 than 3. It is claimed by Peniakoff that the presence of silica in solution resulting from a fusion of bauxite and sodium sulphate can be removed by the addition of calcium aluminate in the lixiviating apparatus. The following reaction is said to take place.



The calcium silicate is thus precipitated and can be filtered off.

Apart from the fact that Na_2SO_4 gives low yields of a rather impure alumina, there is another disadvantage in its use. The Na_2O is recovered as Na_2CO_3 , owing to the precipitation of Al_2O_3 with CO_2 , which would mean that the Na_2O could not be recovered directly in the form in which it is to be used and thus another stage would have to

be introduced into the process. Further experiments were carried out with mixtures of sodium carbonate and sodium sulphate using the same procedure as described previously. The results obtained are recorded in Tables 30 and 31.

It will be seen that the yields of alumina obtained by using a mixture of sodium sulphate and sodium carbonate are less than

TABLE 30

REPLACEMENT OF Na_2CO_3 BY A MIXTURE OF 20 PER CENT Na_2SO_4 + 80 PER CENT Na_2CO_3

Ratio $\text{Na}_2\text{O}/\text{Al}_2\text{O}_3$	Al_2O_3 extracted per cent.	SiO_2 in Al_2O_3 per cent.	Na_2CO_3 recovered per cent.
1 : 1.0	7.7	>1.00	56.0
1 : 1.2	12.0	>1.00	55.0
1 : 1.4	8.2	>1.00	55.0
1 : 1.6	14.6	>1.00	49.0
1 : 1.8	33.0	1.86	51.0
1 : 2.0	34.0	0.74	47.0
1 : 2.5	55.0	0.73	57.0

TABLE 31

REPLACEMENT OF Na_2CO_3 BY A MIXTURE OF 10 PER CENT Na_2SO_4 + 90 PER CENT Na_2CO_3

Ratio $\text{Na}_2\text{O}/\text{Al}_2\text{O}_3$	Al_2O_3 extracted per cent.	SiO_2 in Al_2O_3 per cent.	Na_2CO_3 recovered per cent.
1.6	22.0	0.05	33.0
1.8	19.0	0.17	35.0
2.0	35.0	0.20	48.0
2.5	58.0	0.10	53.0

as with pure sodium carbonate and the alumina obtained is not very free from impurities. An arc spectrogram obtained from a sample of this alumina showed the following impurities: copper, sodium, iron, calcium, tin and magnesium.

Sodium sulphite and bisulphite were also tried, and very poor yields of alumina, of the order of 20 per cent, were obtained.

According to Seailles and Dyckerhoff¹⁸ in a method previously described, good results may be obtained by fusion with lime alone. This proposal looked so attractive that it was investigated in connection with shale.

10 gms. Blaenavon shale ash (Al_2O_3 —36.17 per cent, SiO_2 —52.35 per cent, Fe_2O_3 —4.61 per cent) were fused with 15.25 gms. CaO at 1400°C . for 45 minutes. The mixture was then leached and the soluble alumina precipitated with CO_2 .

Extraction of Al_2O_3 = 9.1 per cent.

Percentage SiO_2 in Al_2O_3 = > 1 per cent.

This process, in the light of these experimental results, does not appear to be nearly as good as a lime-soda fusion. From Rankin's diagrams it would be assumed that the products of decomposition of alumina could not be anything else but ternary compounds insoluble in water.

Thus it does seem that the best results are to be obtained using a charge of shale, sodium carbonate and lime, with approximately 2.5 molecules sodium carbonate to 1 molecule alumina, and 2.5 molecules lime to 1 molecule silica.

It is possible to add the sodium carbonate

to the mixture of lime and shale ash in the form of an 8 per cent solution. This might prove cheaper than recovering the sodium carbonate as a solid.

Experimental results using an 8 per cent solution of sodium carbonate are now quoted. The experiments were carried out in a platinum crucible, the charge being stirred until dry to ensure homogeneity.

TABLE 32

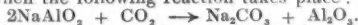
Ratio Na ₂ O/Al ₂ O ₃	Al ₂ O ₃ extracted per cent.	SiO ₂ in Al ₂ O ₃ per cent.	Na ₂ CO ₃ recovered per cent.
1:1.6	34.0	.04	35.0
1:1.8	50.0	.04	50.0
1:2.0	70.0	.06	57.0
1:2.5	76.0	.16	57.0

Comparing these results with those obtained using solid sodium carbonate, very little difference is observed, and it is, therefore, immaterial from the point of view of efficient extraction, whether the sodium carbonate is added as a solid or a solution.

It would probably be more practical to add the shale in the form of uncalcined powdered shale, rather than as ash, since to calcine the shale, and then cool it down again to mix it with lime and sodium carbonate would involve heat losses. Difficulty was experienced initially using fresh shale but by adjusting the calcination times, equally good yields were eventually obtained. If the charge is briquetted using a pressure of 2 tons per square inch, good yields are obtained. This sintering operation was carried out in a rotary kiln on a pilot plant which proved satisfactory. The material attacks clay, plumbago and silica crucibles, so in the laboratory all fusions were done in platinum crucibles.

After furnacing, the charge is ground (85 mesh, B.S.S.) and then leached either with water or a suitable alkaline solution. An elaborate method of leaching in several stages is recommended by Kammermeyer and White¹⁹ which would involve using about 38 gallons of water to produce 1 lb. of alumina. This large quantity of water would make the recovery of sodium carbonate very expensive. Our laboratory experiments show that a straightforward leaching with a quarter the quantity of cold water used by Kammermeyer gives equally good results. It is important not to use hot water since more silica goes into solution with hot water than cold. The leaching time is critical, since if it is too long the sodium aluminate solution decomposes and alumina is precipitated, which is filtered off with the residue, which results in poor yields. The stability of sodium aluminate solution depends on (a) the ratio of Na₂O/Al₂O₃, and (b) the ratio SiO₂/Al₂O₃.²⁰ Since the ratio Na₂O/Al₂O₃ and SiO₂/Al₂O₃ is rather low in the solution resulting from this leaching, the sodium aluminate solution is unstable and tends to decompose quite quickly.

When the leaching is complete the residue is filtered off. The resulting sodium aluminate is then treated with carbon dioxide when the following reaction takes place:



This carbon dioxide is obtained from the kiln gases which will contain approximately 30 per cent carbon dioxide. This reaction is carried out above 70°C. in order to precipitate the alumina in a crystalline, readily filterable form. If the precipitation occurs at lower temperatures, the alumina comes down in a gelatinous, semi-colloidal form which makes it almost impossible to filter and wash free from sodium carbonate. The alumina is then filtered off and thoroughly washed until free from Na₂O. It is then dried and calcined at 1350°C.

An alternative in the process is to leach the sintered mixture with a fairly strong sodium carbonate solution. This results in very good extractions of alumina and recoveries of sodium carbonate, but unfortunately dissolves some of the silica which contaminates the final products. This means that the solution must be submitted to a desilicating process before the alumina is precipitated. A process has been worked out, depending on adsorption, whereby these solutions can be rendered practically free from silica. Desilicating of sodium aluminate solutions or alumina itself is an important subject and will be dealt with more fully later. If this procedure were adopted, less evaporation would be necessary since the sodium carbonate solutions would be much more concentrated throughout.

Different Shales

This process, as described, was now tried out on different types of shale, and the percentage extraction of alumina, percentage recovery of sodium carbonate and percentage silica in the alumina were measured. The first table (Table 33) gives results obtained on shale ash, the shale having been previously calcined at 1000°C. for three hours. The amounts of sodium carbonate and lime were calculated on the analysis of the shale, allowing 2.5 molecules of sodium carbonate and 2.5 molecules of lime to each molecule of alumina and silica respectively. The second table (Table 34) gives results on a briquetted charge (two tons per sq. in.), using fresh shale. The lime and sodium carbonate are in the same proportions as above.

Considering the South Wales coalfield, the high alumina shales lie on the eastern side of it. The percentage extraction of alumina varies considerably but does not seem to bear any definite relation to the composition of the shale. Noticeably higher extractions of alumina were obtained by briquetting a charge of fresh shale (Table 34) than by using powdered ash—(Table 33). The recoveries of sodium carbonate are poor

however. The figures quoted in the tables are percentage sodium carbonate in the leach water after the alumina has been precipitated, thus the losses are occurring in the residue. It has been found possible to extract this sodium from the residue by taking the residue up in a small quantity of water and treating it with carbon dioxide. About 90 per cent of the sodium carbonate can then be recovered.

of the briquette causes the particles to come into more intimate contact and thus the reaction proceeds with greater efficiency. It is interesting that a similar charge of Blaenavon shale to the one quoted in Table 20, briquetted at 7 tons per sq. in., gave a 90 per cent alumina extraction.

In selecting a shale for this process, two facts must be borne in mind. The shale should have a high alumina content and

TABLE 33

Origin of shale	Al ₂ O ₃ in ash per cent.	SiO ₂ in ash per cent.	Fe ₂ O ₃ in ash per cent.	Al ₂ O ₃ extracted per cent.	SiO ₂ in Al ₂ O ₃ extracted per cent.	Na ₂ CO ₃ recovered per cent.
Blaenavon	36.17	52.33	4.61	65.00	0.16	57.0
Glyncastle	30.67	52.39	7.62	66.00	0.29	52.0
Gwaum Cae Gurwen	28.87	56.87	62.40	78.00	0.80	69.0
Parc	26.20	59.52	5.17	40.00	0.32	34.5
Nine Mile Point	33.05	54.10	5.33	53.00	0.08	57.0
Pentalita	33.60	54.86	3.72	80.00	0.47	76.0
Taff Merthyr	35.30	53.72	3.51	58.00	0.09	43.0
Tirpentwys	33.28	53.02	4.46	71.00	0.11	57.0
Tymawr	29.26	58.02	5.20	41.00	0.11	35.0
Tower	31.89	53.30	5.85	58.00	0.11	40.0
Cwm	29.90	56.48	6.50	67.00	0.07	44.2
Elliott	32.89	55.28	4.41	67.00	0.12	56.0
St. Helens I	35.12	58.54	2.08	57.00	0.12	45.0
St. Helens II	37.08	56.50	3.84	50.00	0.20	34.0
St. Helens III	40.66	55.20	0.88	59.00	0.68	57.0
Llanharen	24.53	41.08	19.72	57.00	0.41	54.0
Port Talbot	32.00	55.00	4.60	42.00	0.35	50.0

TABLE 34

Origin of shale	Al ₂ O ₃ extracted per cent.	SiO ₂ in Al ₂ O ₃ extracted per cent.	Na ₂ CO ₃ recovered per cent.
Blaenavon	69.00	0.12	36.00
Glyncastle	75.00	0.72	62.00
Gwaum Cae Gurwen	86.00	0.42	57.00
Parc	90.00	0.74	65.00
Nine Mile Point	77.00	0.20	—
Penallta	66.00	0.28	62.00
Taff Merthyr	65.00	0.04	55.00
Tirpentwys	57.00	0.10	30.00
Tymawr	54.00	0.11	35.00
Tower	70.00	0.08	44.00
Cwm	60.00	0.10	32.00
Elliott	54.00	0.22	40.00

TABLE 35

Raw material	Al ₂ O ₃ per cent.	SiO ₂ per cent.	extraction Al ₂ O ₃ per cent.	SiO ₂ in Al ₂ O ₃ per cent.	in Na ₂ CO ₃ recovered per cent.
Boiler Ash	35.9	52.10	85.0	0.40	84.0
Dross	58.5	8.75	72.0	Nil	65.0
China Clay	32.12	48.60	63.0	0.27	50.0

The fact that the alumina extraction improves and the percentage silica in the alumina decreases when the charge is briquetted, is quite logical, as the formation

thus a colliery situated on the eastern side of the coalfield is indicated. The second factor is the proximity of limestone. Since large quantities of lime are used in this process, transport would be an important item, but if a suitable colliery and a limestone quarry could be found close together, transport of lime (except by a ropeway) could be eliminated.

While this process has been worked out using shale, it is equally well applicable to china clay, boiler ashes, drosses and other aluminiferous materials, as the following results illustrate.

It is worth noting here that the alumina produced from dross by this method was extraordinarily pure and could be used to make high grade aluminium. The percentage silica in this sample was estimated colorimetrically, by a method specially developed for us, and was found to be less than 0.01 per cent, i.e., negligible.

An arc spectrumgram was then taken and compared with an arc spectrumgram of Analur Al₂O₃ (Fig. 1). It will be seen that this sample has much less impurity than Analur

Si ($\lambda = 2516.12$)Si ($\lambda = 2881.58$)Na ($\lambda = 3302.32$)

Analur Al₂O₃
Al₂O₃ from dross
Carbon Carrier



Fig. 1.

Al_2O_3 . Nothing is present except a trace of silica and sodium, both probably about .001 per cent. The sodium line ($\lambda=3302.32$) shows up clearly in the Analar alumina and very faintly in the alumina from dross. The silicon lines $\lambda = 2881.58$ and the group of which the strongest line is $\lambda = 2516.12$ are hardly stronger in the Al_2O_3 from dross than in the carbon carrier used for the sample, but they show up clearly in the Analar alumina.

Samples of pure crystalline alumina prepared (a) in America; (b) in Germany were tested for silica.

	Per cent SiO_2
American sample	.03
German sample	.08
(To be continued)	

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Fish Oils

A DESCRIPTION of the recovery of fish oils was given by Dr. J. A. Lovern, of the Torry Research Station, at a meeting of the Northampton group of the International Society of Leather Trades Chemists, on May 1.

Whale oil, said Dr. Lovern, is mainly produced in the Antarctic, largely on board floating factories, and is obtained not only from the blubber but also from the bones and the oily part of the flesh. All these materials are usually worked up by cutting into small pieces and cooking and disintegrating these with live steam jets inside a rotating perforated drum. Oil and water pass through the perforations, and the oil is separated. Fish liver oils are made by a variety of processes. An old way, still much used, involves cooking and disintegrating the livers by powerful steam jets, which free much of the oil so that it can be recovered either by simple skimming from the surface, or better by the use of a centrifuge. A newer method, which offers advantages in some cases, involves the breakdown of the liver tissues by heating with alkali followed by centrifugal separation of the oil. Several novel methods were also described by the speaker. Fish flesh oils are usually prepared by cooking the fish with open steam, pressing out much of the oil with some water and separating the oil from this mixture. The main species involved in large-scale operations are herring, sardines and menhaden.

Fish oils are refined according to requirements by processes involving removal of residual tissue, neutralisation by alkali, bleaching, deodorisation and removal of solid stearine. The composition of fish oils is very complex and varies markedly according to species and season. The suitability for various purposes varies accordingly.

Major outlets for fish oils include edible fats, medicinal and veterinary oils, soap, paint and leather, while there is a long list of subsidiary uses.

Process Costing

A MEETING of the North-Western branch of the Institution of Chemical Engineers was held at the College of Technology, Manchester, on April 26, when Mr. J. Maddock read a paper on "Process Costing and Cost Control." The president of the Institution, Mr. H. W. Cremer, attended the meeting and was welcomed by the chairman of the branch, Mr. T. Penny.

Having given details of the objects of cost control, Mr. Maddock gave a general outline of expense budgets, standard costs, cost accounting and the use of cost control data. The expense budget, which is reviewed periodically, estimates revenue and the expenditure on sales, on production and on overheads for approximately six months ahead. Standard costs during a given period for process work include the costs of raw materials, of labour and of services such as steam. Cost accounting provides actual cost information for comparison with standard costs and for control purposes. The costing system must record stocks of raw materials and of finished products, apportion wage, service and overhead charges to processes and accumulate other overhead charges under their appropriate headings. When complete, the cost statement is used for selling price purposes and for a comparison of production costs with a standard. The costing system makes possible comparisons between costs, budgets and standards, it also can be used to assess the value of the replacement of old equipment by new and the discontinuation of the manufacture of a product.

Assurance that the quality of plastic products would improve steadily as maximum production was attained and that the next two years would see a substantial difference was given by J. V. Crossley, regional plastic sales manager of the Imperial Chemical Industries, Ltd., speaking in Edinburgh on April 30.

DETAILS OF GERMAN CHEMICALS

Surface-Active Agents, Synthetic Waxes, Etc.

INFORMATION about German surface-active agents, synthetic waxes, etc., is contained in a number of German industry reports compiled by the Allied intelligence teams. This information is, however, distributed throughout 13 reports. From these THE CHEMICAL AGE has extracted the following schedule of substances and their chemical composition, the authorities being B.I.O.S. Nos. 239, 259, 418 421, 478, and 518; Files XXV—26, XXVI—2, XXX—10; C.I.O.S. 13 and F.I.A.T. 137.

Alipal C1. 35%: Dodecyl, poly-3'-ethylene glycol ether sodium sulphate. (* ethylene oxide molecules used.)

Alipal D. 35%: Di-(isohexyl/isoheptyl) phenyl/poly-4-ethylene glycol ether, sodium sulphate.

Alipon CA: Sodium salt of coconut oil fatty acid esters of hydroxy-ethane sulphuric acid.

Alipon OAN: Sodium salt of oxidized paraffin (C_{14}) fatty acid ester of hydroxy-ethane sulphuric acid.

Alipon SBA: Sodium salt of sunflower oil fatty acid ester of hydroxy-ethane sulphuric acid.

Alipon SOAN: Sodium salt of olive oil by-product fatty acids—(and oxidized paraffin (C_{14}) fatty acids — ester of hydroxy-ethane sulphuric acid.

Alipon C1: Sodium salt of coconut or palm kernel fatty acid ester of methyl ester of aminoethanesulphonic acid.

Azalon DR.400: Methylcellulose.

Amphoseife .18: Sodium octadecanesulphonates.

Bohrmittel. HO: Emulphor.

Colloresin DKL: Methylcellulose.

Cyclanons: Fatty alcohol sulphates.

Cyclanon L, LA and LA15: Sodium lauryl sulphate with small additions of Emulphor O and Igepon T.

Powdered Cyclanon L.

Cyclanon O and OA: Sodium oleyl sulphate, with small additions of Emulphor O and Igepon T.

Cyclanon WN double conc.: Cyclanon O, concentrated and small addition of Tylose H.B.R.

Cyclanon WLN: Triethanolamine oleyl sulphate and chloroform and methyl hexalin.

Diglycol Ether: Di(isohexyl/isoheptyl) phenyl/poly-2-ethylene glycol ether 100%.

Dismulgen III: Dodecyl-phenyl poly-30-ethylene glycol ether 100%.

Detergent HO Co. 1/181: Sodium salt of dodecylbenzene sulphonic acid.

Dismulgen IV: Sodium sulphate ester of oleic acid ethyl anilide.

Dekol: Waste sulphite cellulose liquor.

Depanol E.: Pine oil product from camphor synthesis.

Donb.: Dioctadecylthanolamine and 15 mol. ethylene oxide.

Diazopon A: 20% solution of Emulphor O.

Emulphor MW: Di-(isohexyl/isoheptyl)-phenyl/poly-7.5-ethylene glycol ether 100% + 0.5% fatty acids.

Emulphor A.E. (and Renolquan A.): Di(isohexyl/isoheptyl)-phenyl/poly-6.5-ethylene glycol ether.

Emulphor ELN: Di-(isohexyl/isoheptyl)-phenyl/poly-20-ethylene glycol ether 100% + water.

Emulphor STH: Sodium paraffin (C_{14} - C_{18}) sulphaomido acetate + free C_{14} - C_{18} hydrocarbon + 4/8% $C_{14}H_{18}$ + sulphamide + 1/2% $C_{14}H_{18}$ -disulphimide.

Eulysin PC: Butyl aniline + Emulphor HO.1/48 + water.

Emulphor STS: Di-(isohexyl/isoheptyl)-phenyl/poly-7.5-ethylene glycol ether.

Emulphor A: Poly-6-oxyethylene-oleate.

Emulphor EL: Poly-40-oxyethylene — castor oil condensate.

Emulphor FM: Triethanolamine mono-oleate.

Emulphor O: Poly-20/25-oxyethylene-sperm oil alcohols ether.

Emulphor OL: Poly-35-oxyethylene-dihydroabietyl alcohol ether.

Emulphor STL: Igepal NA + free fatty acid + ammonia + cyclohexylamine + oleic acid + spindle oil.

Emulgator A: Di-(B-chloroethyl) ether C_{14} -amine condensate.

Emulgier Waz P.S.: Oxidised Waz X.

Feltron C.: Benzylnaphthalene Formaldehyde condensate.

Granton: Emulphor STS, 10% + Mineral Oil, 9% + Oleic acid, 1% and 1% water and dye.

Humetal CX: Sulphonation product of oleyl di-isobutyl amide and oleic acid.

Igepon A.P. (High Conc.): Sodium salt of oleyl ester of hydroxyethane sulphuric acid.

Igepon T.: Sodium salt of oleyl ester of methyl ester of aminoethane-sulphonic acid.

Igepal B. conc.: Di-(isohexyl/isoheptyl) phenyl/poly-50-ethylene glycol ether, sodium sulphate.

Igepal C. Extra Conc.: Dodecyl-phenyl/poly-12-ethylene glycol ether 100%.

Igepal C. Conc.: Igepal C. extra conc. + dodecyl-phenyl/poly-5-ethylene glycol ether, sodium sulphate + distilled water.

Igepal W. Ex. C.: Dodecyl-phenyl/poly-6-ethylene glycol ether 100%.

Igepal W. Conc.: Igepal W. Extra Conc. + dodecyl-phenyl/poly-5-ethylene glycol ether, sodium sulphate.

Igepal L. Conc.: Igepal W. Ex. Conc. + Dodecyl-phenyl/poly-5-ethylene glycol ether sodium sulphate + dodecyl-phenyl/poly-7-ethylene glycol ether 100% + hexyl acetate + water.

Igepal E. Ex. Conc.: Iso-octyl-phenyl/poly-9-ethylene glycol ether 100%.

Igepal F. Conc.: Igepal F. Extra Conc. + dodecyl-phenyl/poly-5-ethylene glycol ether sodium sulphate.

Igepal M.: Mesapon N + dodecyl-phenyl/poly-5-ethylene glycol ether sodium sulphate.

Igepon K.T.: Sodium salt of coconut (or palm kernel) fatty acid and chloride ester of amino-ethane sulphonic acid.

Igepon KTN: Igepon KT—spray dried.

Igepon KTW neu. 35%: Igepon KT—using coconut fatty acids and diluted to 35% fatty matter content.

Igepon 702K: Alipon CT.

Igepal C. 55%: Igepal C. Conc. + Igepal B. Conc. + water and inorganic salts.

Igepal B. 35%: Igepal B. Conc. + water.

Igepal W. 35%: Igepal W. Extra Conc. + Igepal B. Conc. + water and inorganic salts.

Igepal F. 35%: Igepal F. Extra Conc. + Igepal B. Conc. + water and inorganic salts.

Igepal L.: Detergent (HO.170. DO/SR)/10.5 molecules ethylene oxide + Igepal B. Conc. + water and inorganic salts + Depanol E. + C_{14} - C_{18} alcohols ex. methanol synthesis.

Igepal M.: Igepal B. 35% + Mersolat. D.80% + water.

Igepal CM.: Igepal C. Extra Conc. — Mersolat. D.80% + water.

Igepal NA.: Sodium alkyl (C_{14}) benzene sulphate.

Igepon B.: Sodium (N-oleyl derivative of 3-hydroxy-butylamine) sulphate.

Kawit K.F.: Dimethylolurea.

Kawit AK2 (and MKF.): Melaniline-formaldehyde-triethanolamine product.

Katonal O.: Sulphonized phenol product.

Katonal ON.: Sulphonized phenol product.

Katonal SL.: Tin containing sulphurized phenol.

Luna.: Spindle oil, Emulphor A. and Soromin S.G.

Leonil. C.: Polyoxyethylene/dodecyl ether.

Leonil. OS.: Polyoxyethylene/oleyl ether.

Leonil. SB.: Sodium butyl sulphate.

Leonil. SB. Ex.: Sodium butyl-naphthalene sulphate.

Leonil. WS.: Ethylene oxide derivative.

Leonil. S.: Benzylnaphthalene sulphonic acid.

Leonil. O.: Poly-15-oxyethylene/cetyl alcohol ether in aqueous solution.

Leonil. FFO.: Poly-6-oxyethylene isohexyl/isoheptyl-B-naphthol ether.

Leonil S.: Benzylnaphthalene-sulphonic acid.
LX 4644: Poly-60-oxyethylene/lauryl ether.
Medialan A.: Sodium salt of oleyl glycol methy-
 aminoacetic acid condensation product.
Medialan A.L.: Medialan + Depanol E.
Mepasol: Alkyl (C_{12} - C_{18}) sulphionate.
Mepasin: C_{12} - C_{18} saturated hydrocarbons.
Mersol B.: C_{12} - C_{18} mono- and di-sulphone chlorides.
Mersol H.: Mepasin mono-sulphon chloride + di-
 sulphon chloride + straight mepasin (i.d. CO. 50%).
Nekal A.: Isopropional naphthalene sulphonic acid.
Nekal B.X.: Butanol naphthalene sulphonic acid.
Persistols LA.: Methylolstearamide.
Persistol LB.: Vinyl octadecyl ether-maleic anhydride
 interpolymer.
Persistol V.S.: Octadecyl ethylene urea.
Persistol K.F.: Betaine of octadecyl chloromethyl ether
 and diethylanmoacetic acid ester.
Palmaechtraltz OS.: Leonil OS.
Peregal C.: Leonil C.
Persistol W.S.: Stearic methylolamide + 2% paraffin
 wax + 2% Igepal C + 57.9% water + disinfectant
 0.1%.
Persistol LA.: Stearic methylolamide.
Persistol LB.: Maleic anhydride/vinyl octadecyl ether
 interpolymer.
Peregal CK.: Quarternary salt of Polyoxyethylene/
 oleylamine condensate + medialcin.
Rapidogenemickler-N.: Diethylamino-ethanol.
Remolgan A.: Di-(isohexyl/isoheptyl)-phenyl/poly-7-
 ethylene glycol ether + water.
Rotton: Emulphor STS, 25% + mineral oil, 75% + Oleic
 acid 1% + 25% water and dye.
Servitol OL Conc.: Emulphor MW + mineral oil +
 C_{12} - C_{18} fatty acids.
Setamol W.S.: Sodium salt of naphthalene-B-sulphonic
 acid-formaldehyde condensate.
Sericoce LC.: Acetyl cellulose.
Soromin S.: Triethanolamine salt of oleic and stearic
 acid chloride/methylaminoacetic acid condensation
 product + Igepon I. 33% + water; in emulsion
 form.
Soromin W.F.: Medialan A + tallow polyglycerol ester
 100% + Di(isohexyl/isoheptyl)-phenyl/poly-20-ethy-
 lene glycol ether + water; in emulsion form.
Soromin F.: Sodium salt of stearic acid chloride/methyl
 amino acetic acid condensation product + Igepon I
 + water.
Soromin S.G.T.: Stearyl (impure polyethylene glycol)
 ether.

Soromin D.M.: Tallow polyglycerol ester 100% +
 Di(isohexyl/isoheptyl)-phenyl/poly-20-ethylene glycol
 ether + water; in emulsion form.
Servitol AC Conc.: Servitol OL Conc. + "DOMB."
Servitol Reissol Beuton: Emulphor A + mineral oil.
Soromin T.: 1:3-Butylene glycol adipate.
Soromin A.: Formate of triethanolamine stearate.
Soromin A. Base: Triethanolamine mono-stearate.
Soromin A.F.: Poly-2-oxyethylene triethanolamine
 mono-stearate.
Soromin A.F.K.: Polyoxyethylene stearyldiethanolamide
 condensate.
Soromin A.F.Z.: Poly-2.5-oxyethylene stearethanolamide
 condensate.
Soromin D.B.: Dibutyl ethanolamine stearate.
Soromin F.L.: Diethylenetriamine and triethylenetetra-
 mine stearates.
Soromin S.G.: Poly-6-oxyethylene stearate.
Tylose (and Coloresin): Sodium salt of cellulose-oxyacetic
 acid.
Tylose HBR.: Sodium salt of a cellulose glycollic ether.
Tylose 4S.: Methylcellulose.
Trilon A.: Sodium salt of imino-triacetic acid.
Trilon B.: Ethylene (bis)-iminodiacetic acid.
Wetting Agent 2406: Tri-isobutyl-beta-naphthyl/poly-
 10-ethylene glycol ether 100%.
Wax S.: Oxidized Montan Wax.
Wax K.P.: Mixed ethylene butylene glycol esters of
 Wax S.
Wax K.P.S.: Wax K.P.
Wax B. (unbleached): Mixed ethylene glycol esters of
 Wax S. + woolfat, paraffin wax, etc.
Wax B. (bleached): Wax B. (bleached).
Wax E.: Wax S. ethylene glycol esters.
Wax E.G.: Wax S. propylene glycol esters.
Wax N.: Wax B. (unbleached) + Marseilles soap and
 emulphor.
Wax CR.: Montan wax + butylene glycol esters of
 Wax S.
Wax L.: Similar to Wax S.
Wax G.: Lightly bleached Montan wax.
Wax O.: Ethylene glycol esters and calcium soaps
 mixture of Wax S.
Wax O.P.: Butylene glycol esters and calcium soaps
 mixture of Wax S.
Wax A.D.: Wax O. but propylene glycol esters.
Wax Z.: Hydrogenated ketone of Wax L.
Wax O.Z.K.: Hydrogenated ketones from mixed Montan
 wax, train oil and hardened train oil.
Wax V.: Polymerized vinyl ether of octadecyl alcohol.

Revival of Austrian Technical Journals

SOME Austrian technical journals which disappeared during the Nazi annexation of Austria and were merged with German ones, have now been revived. Among them the *Oesterreichische Chemiker Zeitung*, the journal of the Society of Austrian Chemists and of the Chemical-Physical Society. It started its 48th volume with a 56 pp. January-February, 1947, double number, and is published by the Springer-Verlag, Vienna. After an introduction describing the scope and intention of this revived paper, the number contains seven original articles, some of them in English, which show that Austrian research and science have established contact again with scientific discovery and development throughout the world and with both academic learning and technological advance. The other items which will appear regularly are: scientific information; calendar of and reports on meetings and lectures; abstracts from other chemical journals and surveys comprising

foreign literature; book and patent reviews, and personal and academic notes, etc. The same publishers, Springer-Verlag, Vienna, at the same time announce the appearance of the following periodicals: *Monatshefte für Chemie*, edited by the Academy of Science, Vienna, and *Mikrochemie*, combined with *Microchimica Acta* and of various scientific and technical handbooks. The Springer publications have always been on a high level and will surely regain their pre-war reputation. It is hoped that they will soon be seen in the various scientific libraries of London as they were pre-war.

Electro-Chemistry Laboratory

The Council of Scientific and Industrial Research, India, is exploring the possibility of developing a separate laboratory for electro-chemistry, according to Sir Shanti Swarup Bhatnagar, Director of the Council of Scientific and Industrial Research, in a statement made at Poona.

Industry and the Road Ahead

AT the annual general meeting of the Federation of British Industries on April 30, Sir Clive Baillieu, the retiring president, said the advent to political power of a Labour Government, pledged to policies and plans involving vast structural changes in the industrial and economic life of this country, had confronted this Federation with a major decision on policy, pregnant with far-reaching consequences, for ourselves and the future of our country. These plans and these policies rested upon principles to which we were opposed. They involved vast and, it seems, a reckless extension of State ownership and responsibility during the difficult and dangerous period of transition from war to peace.

While we have not yielded our belief that private enterprise is the best basis for a prosperous national economy, however, we have sought to broaden the area of agree-

ment between Government and industry, upon which the smooth and continuous reconstruction of our national life must proceed. While we have constantly made known our opposition to, and emphasised the grave dangers arising from, the vast structural changes involved in the Government's schemes of nationalisation, we have made liberal and constructive proposals to improve the working relationship of Government and industry. While we understand the mandate which the country has given to the Government for its social and economic policies, we have constantly urged the Government not to rush their programme, and to place production and prosperity above party plans and policies.

Sir Clive Baillieu concluded by reiterating his belief that the people of Britain would fight their way through to recovery.

Chemical Research in Scotland: New Developments

THE possibility of the production in Scotland on a commercial scale of Ardil, a wool-like fibre from protein was indicated at the afternoon session of the F.B.I. conference in Glasgow on April 25 by Dr. J. W. M'David, chairman of the explosives division of the I.C.I. at Ardeer, Ayrshire. Dr. M'David, who was speaking on research as a means of providing new industries, gave the discovery of the new fibre as an instance of the value of a live research department in developing new products. Research on the production of fibre from protein, he said, had begun before the war. But they now had at Ardeer a pilot plant making half a ton a week of Ardil fibre from groundnut meal.

"We have not yet made a full assessment of the process," said Dr. M'David, "though technically we have I think, ironed out most of the difficulties. Should it be decided to go ahead with this manufacture, the first plant will almost certainly be situated in Scotland."

Dr. M'David also said that one of their development chemists conceived the idea that something might be made from sand which was found in abundance at Ardeer. The answer was "sand lime bricks." The bricks consisted of over 90 per cent sand and the remainder lime, and they had recently produced samples which were very promising. The bricks were at present being tested out by the Building Research Association, and if as they expected, they reported they were satisfactory they intended to install a plant at Ardeer for their manufacture.

Dr. William M. Cumming, professor of chemistry in the Royal Technical College,

Glasgow, speaking on chemical research for Scottish industry, asked: "Does it redound to Scotland's credit that even now she can find attractive employment for only 10 per cent of science graduates sent out by her universities? So long as there are 40 graduate scientists employed in England for every one in Scotland, or five to one on a population basis, Scottish industry, chemical or otherwise, cannot hope to take its full share in the future national prosperity."

The development of Pentaerythritol, a substitute for linseed oil and glycerine, with very great potentialities in many industries was also detailed by Dr. McDavid. This substance now being used mainly in the paint and lacquer field in partial replacement of linseed oil and glycerine and to give products which may have a use as plasticisers will, I.C.I. believe, have a considerable scope and is being turned out in considerable volume.

Speaking of the manufacture of nitrocellulose at Ardeer, Dr. McDavid said that at the moment the I.C.I. is supplying practically the whole of the requirements of nitrocellulose for the leathercloth and cellulose lacquer manufacturers in this country. When first they started this manufacture cotton linters were used as the raw material, but to-day, owing to the shortage and high price of linters, they have turned over to the use of wood pulp as the raw material. "We are at the moment developing the manufacture of another cellulose ether, namely, ethyl cellulose," added Dr. McDavid, "a substance which is soluble in organic solvents and is used for the manufacture of special laquers and enamels."

CIBA REPORT

Favourable Post-War Developments

MUCH interesting reading is provided in the report for 1946 issued by the Ciba, Basle, Switzerland, one of the world's leading manufacturers of chemicals, especially dyestuffs, and pharmaceutical products, a copy of which has just been received in this country. In the first business year after the cessation of hostilities manufacturing plants were operated to their full capacity.

The increase in output, both in the plants located in Switzerland and in those established abroad, has brought about greater raw material requirements which could only be met with great difficulty.

The first stages of the programme of renovation and extension of the company's Swiss manufacturing units, which was commenced last year, has now been completed.

Expenditure for research has been increased to frs. 9,746,894, an increase of frs. 1,870,000 over 1945.

Both the parent firm and the subsidiary companies overseas report increases in both turnover and net profits and it has, moreover, been possible to regain a footing in a number of Continental markets which had been closed to the Ciba as a result of the war. The dividend has been increased from 16 per cent to 20 per cent, the net profit being frs. 11,245,045, as compared with frs. 9,238,765 in 1945.

Considerable attention is devoted, in the annual report, to developments in the dyestuffs field. There has apparently been a shift in demand for the various classes of dyestuffs, due mainly to the increasing replacement of synthetic fibres by natural fibres. In the field of azodyestuffs, a new development has been inaugurated with the production of exceptionally pure wool dyes, while a number of new *Coprantine* dyes have also been brought on the market. At the same time, several new auxiliary products, especially cellulose derivatives, have been developed.

The plastics division had to reserve its output for the Swiss market; exports have had to be postponed until the new plant in the Monthey factory has been completed. Two new pharmaceutical products are reported, *Antistine*, an antiallergic, and *Fenocyclin*, a synthetic substance with oestrogenic effect. The U.S. subsidiary also produced an antiallergic under the name of *Pyribenzamine*, which has met with conspicuous success. A number of specialities have been developed and will shortly be placed on sale.

A wealth of information is provided on the activities of the Ciba's widely-ramified overseas subsidiaries. During the past

year, the special organisations, established in the early part of the war, to safeguard the independent control of the subsidiaries, has been dissolved and the resumption of their administration by the Swiss parent is reported to have taken place. Although profits have increased, transfer difficulties have prevented the company from bringing them to Switzerland; instead, they were used for an expansion of the overseas businesses.

The Cincinnati Chemical Works, Inc., Cincinnati, the affiliated American dyestuff plant, reports satisfactory results. Apart from the erection of a plant for the manufacture of insecticides, war-time conditions retarded the provision of new plant, but a further expansion of this important unit is at present being studied. The Clayton Aniline Co., Ltd., Clayton, Manchester, showed a greater volume of production than in 1945, but here too a re-equipment and expansion of the plant for both dyestuffs and intermediates is stated to be essential. As regards the pharmaceutical units, *via*, Ciba Pharmaceutical Products, Inc., Summit and Ciba Laboratories, Horsham (formerly Ciba, Ltd., Horsham), both are developing favourably.

For the first time since the war-time reverses, the Ciba's affiliated companies on the continent of Europe report an increase in their activities. The French branch, at St. Fons, reported an upward trend because of the improved raw material position, while the Italian company, the Società per l'Industria Chimica, Seriate, reported rising figures for both output and profits for the first time since the war. The works of the Polish dyestuffs factory at Pabianice are to be nationalised; since the arrival of Soviet troops in 1945, they have been under Government administration. Finally, as regards the two Swiss works at Basle and at Monthey, the report states that the fuel position had improved.

Chemical Shortage in Chile

Chilean importers state that, despite increased arrivals, chemical stocks are decreasing rapidly. Demand is greater and consumers who were reluctant to buy entered the market when it became apparent that world chemical prices would not drop sharply. Many products, particularly alkalis, resins, acids, and pigments and colours are still in short supply and there is little hope of immediate relief. The United Kingdom increased its chemical exports to Chile last year but they were not sufficiently large to offer strong competition.



A CHEMIST'S

BOOKSHELF

Stainless and Heat-Resisting Steels. By Edwin Gregory and Eric N. Simons. London: Hutchinson & Co. (Publishers), Ltd. 1947. pp. 131. 8s. 6d.

In this book the authors have produced an up-to-date work on the wide range of stainless and heat resisting steels, which proved invaluable during the war and are increasingly used in times of peace. After a careful classification from the metallurgical point of view of the various types of steels, this scientific and technical publication proceeds to a comprehensive discussion of the methods of working and heat treatment, as well as of the properties and application of each type of steel, clearly explained to even the non-technical reader. Numerous charts, tables and diagrams as well as a subject index and ample illustrations complete this plainly written treatise, which will be valuable to the student and user of these materials.

Let Us Know the Worst. By Sir Ernest Benn. London: Society of Individualists. 6d.

Except among those who are very young indeed, a day never passes in the course of which men and women do not discuss the urgent and unpleasant business of surviving the present crisis. But they do not often express themselves as trenchantly and in so connected a form as does Sir Ernest Benn in his pamphlet "Let Us Know the Worst," published at 6d. by the Society of Individualists. The author has the advantage of a knowledge, already mature, of men and affairs before 1914, and of an unabated activity of mind and perception in 1947. He can thus balance the two eras one by the other, and presents his statement of account to the general reader in the space of an essay that gathers up the loose threads of thoughts in the minds of many, thereby making the causes of our ills, and the remedy for the ills themselves, plain for all to read.

The title of the pamphlet is not really descriptive of its contents. "Let Us Know the Worst" is not an appeal, but a dissection of what is amiss in England now, and an assertion of the true remedy. That remedy is a plain and simple one. Its adoption would call for no expensive legislation. It lies, moreover, within the reach of everyone. From the beginning of the Lloyd Georgian era in politics to the elec-

toral triumph of Mr. Attlee, Sir Ernest traces—with facts and figures—a deterioration in our political values that began when the idea got about "that a cash value could be attached to the vote." Politics have taken charge of the counting house and the workshop. We are paying the price in ever-increasing poverty. The argument, stated only baldly in this review, is developed by the author with thoroughness and fire. It makes most interesting reading by virtue alike of its matter and the style in which it is written. There is a gleam of hope, for there is a remedy, based upon our last remaining major asset. Those who want to know what that asset is, and the remedy that can be found in its proper application to our needs, find the answer in this rewarding sixpennyworth. Sir Ernest has again done a service to all who feel the need of guidance in thinking clearly about the way out of our present bondage.

Patent Rules, 1947 Reciprocity with the U.S.

THE Board of Trade has recently issued the Patent Rules, 1947, No. 484, establishing reciprocity for U.S. citizens with the benefits conferred on British subjects by the U.S. Public Law No. 690, as follows:

17 A: The period for filing a patent application in Great Britain claiming the U.S. priority date has been extended until August 8, 1947, for U.S. applications made between September 8, 1938, and August 8, 1946.

17 B, C: Pending British patent application can be converted into priority applications before August 8, 1947.

17 D: No claims can be based on such application against the British Government and persons having acquired third party rights before August 8, 1946, unless as a consequence of communication under the Agreement for the Supply and Mutual Exchange of Articles and Information.

17 E: The term of such patent not to exceed 20 years from first foreign filing date.

36 A, B, C: Patents or patent applications communicated under the said Agreement not to be invalidated by prior publication or use consequential on such communication, and to have priority over corresponding patent applications of any communicatee, which may be refused, or a patent granted on them revoked.

Parliamentary Topics

Miners Unemployed.—There were 5174 men and boys in the coal mining industry registered as wholly unemployed on March 10. This figure is slightly more than half the number placed in employment in the collieries between January 23 and March 19. This was revealed by the Minister of Labour replying to a question by Mr. W. Foster, in the course of which he stated that vacancies in the coal mining industry which were still unfilled on March 19 totalled 10,976.

Bulk Metal Buying.—Lieut-Colonel Dower asked the Minister of Supply how long he intends to continue the existing policy of bulk purchase in the metal market; and when he will be in a position to state when this market will be freed. Mr. W. Leonard (joint Parliamentary Secretary): I regret that I cannot at present say when bulk purchasing of metals will be brought to an end.

No U.S. Isotopes.—Mr. J. Piratin asked the Minister of Supply whether, arising from his request, the U.S. Government has provided him with supplies of radio-active iodine and other isotopes; and if he will state in detail the character and quantity of these supplies. Mr. A. Woodburn (joint Parliamentary Secretary): No, sir. The American Atomic Energy Commission has not yet approved the export of these materials.

Safeguarding Atomic Workers.—The Ministry of Supply, having consulted the factory department of the Ministry of Labour and medical advice, is satisfied that all the necessary steps are being taken to protect workers at plants associated with the production of atomic energy from radio-active and other substances.—Mr. A. Woodburn.

Funds for Research.—The Treasury estimates for 1947-48 provide for expenditure on research of all kinds of about £63 million. In addition, a substantial part of the grant of nearly £12 million to universities is spent on research.—Mr. Glenvil Hall.

British Celanese

British Celanese will start production for the plastic trade at the end of the month at the Marchwiell Trading Estate, near Wrexham. The conversion of buildings is proceeding. The type of plastic material to be manufactured is not revealed, but a representative of the firm said he believed there was no other firm in North Wales producing similar goods. Eventually, about 4500 will be employed. British Celanese are the second firm to take over buildings at Marchwiell.

Chemistry at Glasgow

The University of Glasgow is to celebrate the bi-centenary of the establishment of its modern chemistry department by the introduction of a series of lectures. The teaching of chemistry in the university was modern chemistry department by Dr. William Cullen by the introduction of a series of lectures.

May 9: Douglas Guthrie, M.D., F.R.C.S.E., F.R.S.E.; on "William Cullen and His Times."

May 16: Professor John Read, M.A., Ph.D., Sc.D., F.R.S., on "Joseph Black, the Teacher and the Man."

May 23: Alexander Fleck, D.Sc., F.R.I.C., on "Scottish Industrial Development of the Cullen/Black Period."

May 30: Professor A. R. Todd, D.Sc., D.Phil., F.R.S., on "Glasgow Chemistry in the Twentieth Century."

Next Week's Events

MONDAY, MAY 12

British Industries Fair. Olympia, Earls Court, Castle Bromwich, May 12-16. 9.30 a.m. to 7.30 p.m.

Engineering and Metalcraft Exhibition, Horticultural Hall, Westminster, London, S.W.1. May 12-23.

Royal Society of Arts, John Adam Street, London, W.C.2. 5 p.m. Dr. D. A. Spencer: "Industrial Photography."

WEDNESDAY, MAY 13

Iron and Steel Institute. 4 Grosvenor Gardens, London, S.W.1. Annual general meeting. May 13-16.

THURSDAY, MAY 15

The Chemical Society (joint meeting with the University Chemical Society). Chemistry Lecture Theatre, Sheffield. 5.30 p.m. Professor J. B. Speakman: "Some Relationships between the Structure and Properties of Natural Synthetic Fibres."

Royal Society, Burlington House, Piccadilly, London, W.1. 4.30 p.m. Sir Alfred Egerton and G. J. Minkoff: "The Formation of Hydrogen Peroxide in the Combustion of H at Low Pressures."

FRIDAY, MAY 16

The Chemical Society (joint meeting with the Society of Chemical Industry and the Royal Institute of Chemistry). Chemistry Lecture Theatre, the University, Manchester. 6 p.m. Dr. G. M. Dyson: "A new Notation for Organic Chemistry."

Personal

MR. RALPH ASSHETON, M.P., has become a director of Borax Consolidated, Ltd.

DR. E. C. CRONSHAW, a director of I.C.I., has left for India.

MR. W. F. CARR, of Wath-on-Dearne, has been appointed Divisional Carbonisation Officer to the Northern Division of the National Coal Board.

MR. A. B. INNES DICK, A.C.A., secretary of Tube Investments, Ltd., has been appointed joint managing director of the subsidiary company, Talbot-Stead Tube Co., Ltd., Walsall.

SIR WILLIAM J. LARKE, director of the British Iron and Steel Federation for twenty-four years, has been awarded the Bessemer Gold Medal for 1947 in recognition of his development of research.

MR. E. W. COLBECK, metallurgist to the I.C.I. (Alkali Division), who was on loan as special metallurgical adviser to Dr. Cockcroft in the Department of Atomic Energy, Ministry of Supply, has been appointed director in charge of the research and metallurgical departments of Messrs. Hadfields, Ltd., from July 1 next.

At a ceremony at the American Embassy on May 1 MR. J. DAVIDSON PRATT, director and secretary of the Association of British Chemical Manufacturers, was awarded by the American Government the Medal of Freedom with silver palms for exceptionally meritorious work and co-operation with the United States while Controller of Chemical Defence Development at the Ministry of Supply from 1940-1945.

At the F.B.I. annual general meeting on April 30, SIR FREDERICK BAIN, M.C., was elected president of the Federation in the place of Sir Clive Baillieu, K.B.E., C.M.G., who retires from the presidency, having held office for two years. Sir Frederick Bain, a deputy chairman of Imperial Chemical Industries, Ltd., was appointed deputy president of the Federation in February, 1946, and, during Sir Clive Baillieu's recent visit to South Africa, acted as president.

On the recommendation of the National Committee for Chemistry, the Council of the Royal Society at its last meeting nominated MR. H. V. POTTER, managing director of Bakelite, Ltd., as one of the British delegates to the Council of the International Union of Chemistry and also to the General Assembly of the International Union meeting. Both these meetings are to be held in London from July 17 to 24. Mr. Potter has also been nominated as representative of the British National Committee for Chemistry at the XIth International Congress of Pure and Applied Chemistry.

SIR ERNEST OPPENHEIMER, the EARL OF BESSBOROUGH, and MR. J. B. DENNISON, have been appointed directors of Rhodesia Copper Refineries, following the resignation of LORD GEDDES and DR. J. G. LAWN. Sir Ernest has been appointed chairman, with MR. S. S. TAYLOR as deputy-chairman.

MR. R. K. SPEIRS has been appointed chief chemist for the Anglo-Iranian Oil Co., Ltd., in Iran. Since April, 1933, he has

Mr. R. G. H. Latham, who as previously announced, is the new president of the British Iron and Steel Research Association.



been with the company's chemical organisation there and served in various centres before returning to Abadan as a development chemist in 1938. Mr. Speirs succeeds Mr. W. M. Catchpole, who has been transferred to the company's production department development section, Sunbury.

DR. FRANKLIN KIDD, who has become Director of Food Investigation in the Department of Scientific and Industrial Research, was superintendent of the Low Temperature Research Station, jointly controlled by the D.S.I.R. and Cambridge University and concerned with investigations into the fundamental processes in regard to preparation, storage and distribution of food.

MR. W. L. HALL has been appointed chief officer of the Liaison Department of the British Non-Ferrous Metals Research Association in succession to MR. W. C. F. HESSENBERG, who has been appointed head of the Mechanical Working Division of the British Iron and Steel Research Association. Mr. Hall joined the research staff of the British Non-Ferrous Metals Research Association in 1938, working on galvanising, stress corrosion of light alloys and the properties of aluminium-magnesium alloys. He has been with the Liaison Department since 1944.

Home News Items

Telephone Change.—The telephone number of the Morgan Crucible Company is now Battersea 8822.

London Telephone Directory.—Because of paper shortage the London Telephone Directory is being divided into four parts immediately, instead of waiting until July as previously arranged.

Change of Address.—As from May 1, 1947 Max Factor & Co., Inc., is moving its factory and offices to Francis Avenue, Ringwood Road, West Howe, Bournemouth, to which address all goods and correspondence should be sent. Telephone: Bournemouth 7182-6.

Organisation of Works Libraries.—At a conference of the northern branch of the Association of Special Libraries and Information Bureaux in Sheffield recently, presided over by Mr. W. H. Higginbotham, chairman of Edgar Allen & Co., Ltd., papers were given by officials of various local firms and over a hundred delegates attended. The main subject was the organisation and scope of works libraries. A party of delegates visited the works and research section of Edgar Allen & Co., Ltd.

Steel Company of Wales.—The Steel Company of Wales has been registered with a capital of £40,000,000 and with borrowing powers to the same amount. This is in connection with the important plan for modernising the South Wales sheet and tinplate industry. The chairman of the new company is Mr. E. H. Lever (chairman and managing director, Richard Thomas and Baldwins) and the deputy chairman is Sir Charles Bruce-Gardner (chairman, John Lysaght). Other directors are: Mr. J. H. Jolly (chairman, Guest Keen Baldwins), Sir Evan Williams (chairman, Llanelly Associated Tinplate Companies), Mr. W. F. Cartwright (director, Guest Keen Baldwins), and general manager, Margam and Port Talbot Works), Mr. Leslie J. Davies (director, Richard Thomas and Baldwins), and general manager, Ebbw Vale Works), Capt. H. Leighton Davies (general manager, R.T.B.), Mr. S. E. Graeff (technical adviser, R.T.B.), Mr. R. A. Hacking (technical adviser, R.T.B.), Mr. T. O. Lewis (general manager, R.T.B.), Mr. E. C. Lysaght (managing director, John Lysaght), Mr. E. Julian Podge (managing director, Guest Keen Baldwins), Mr. H. F. Spencer (commercial manager, R.T.B.), Mr. C. R. Wheeler (managing director, Guest Keen Baldwins). The secretary of the company is Mr. David J. Young.

Welsh Tinplate for Russia.—One thousand tons of Welsh tinplate has been shipped from Swansea to Vladivostok. This is the first tinplate to be shipped to Russia since 1936.

British Iron Ore Company.—Negotiations for the purchase by the Norwegian Government of the properties in Norway of the Sunderland Iron Ore Co., a British concern, are reported to be nearing their conclusion, and a price of £400,000 is mentioned.

Non-Ferrous Scrap Metals.—The stock of non-ferrous scrap metals on charge on March 31 was 47,842 tons, while sales for the two months' period February/March, 1947, amounted to 10,907 tons (approximate value £655,000).

Applied Photography.—An exhibition of applied photography is to be held at Australia House, Strand, London, W.C.2, from May 7-16. The exhibition, organised by Kodak Ltd., will be open each day from 10 a.m. to 5.30 p.m. (except Saturday and Sunday).

Soap Substitutes.—Major K. Gordon, joint managing director of the Billingham (Durham) division of Imperial Chemical Industries, speaking at a Newcastle-on-Tyne press conference on May 1, said: "In the future, soap substitutes are going to be a regular part of domestic equipment. Some of them are better for the purpose than soap."

Radioactive Substances.—Powers to search non-residential premises, vehicles and ships if necessary by force under a magistrate's warrant are granted under the provisions of the Radioactive Substances Bill, presented on April 24 in the House of Lords by Lord Inman (Lord Privy Seal) and read a first time. Subject to certain provisions, no person may manufacture, hold or use any radioactive substances except under licence from the Minister of Supply. Penalties range from a £20 fine up to £200 and/or three months' imprisonment.

£149,000 For Training.—Gifts by Courtaulds, Ltd., rayon manufacturers, "to encourage the development and expansion of textile technological training in subjects of importance to the British rayon industry" now total £149,000. Colleges which will benefit, in addition to that at Bolton, to which the award of £30,000 was reported recently, include Bradford, £30,000; Blackburn, £10,000; Huddersfield, £5000; Oldham, £8000; Preston (Harris Institute), £4000; Burnley, £3000; Keighley, £3000; Halifax, £3000; Nelson, £3000.

Overseas News Items

Czech-Polish Trade Agreement.—Poland is to supply coal and zinc and Czechoslovakia caolin and technical equipment among other commodities under a goods exchange agreement signed in Prague.

Hydrogen Peroxide.—The Commercial Minister of the British Embassy, Buenos Aires, reports that the hydrogen peroxide industry there has been declared as "of national interest" and an annual import quota of 50 tons has been fixed.

Magnesium Use.—Although the bulk of American magnesium output is still going into warplanes, production of commercial items is mounting as new uses for the metal are found. About 60 per cent are used in airplanes and aeroplane motors, the other 40 per cent for commercial users.

Currency Difficulties for China's Trade.—Ships are now frequently calling at Chinese ports without loading any cargo because the prices of certain commodities, not only for the home market but also for foreign buyers, are too high on the basis of existing exchange rates. This applies particularly to the important silk, edible oils and soya-bean trade.

Synthetic Rubber Process.—A new process for producing synthetic rubber which dispenses with chemicals in one stage of the process is stated by Mr. M. A. Youker, of E.I. Du Pont de Nemours, U.S.A., to have greatly facilitated production. Neoprene latex is converted into a thin rubber-like film by freezing on the surface of a metal cylinder, which gives a film of rubber mixed with ice crystals.

Austrian Mineral Survey.—Austria's mineral resources are to be investigated afresh by the recently reconstructed Geological State Department, comprising all mining and montanistic resources. Petroleum deposits and raw materials for a restoration of the chemical industry, such as phosphorites and potassium salts, are sought. General geological maps and the re-publishing of the Geological Proceedings and of the Geological Yearbook are in preparation.

South Africa Mineral Production.—The Union of South Africa, Department of Mines, gives the following summary of production of the more important base minerals during the first six months of 1946 with comparative figures for the first half of the previous year: asbestos 9,668 tons (14,789), chrome 99,045 tons (33,138), coal 12,957,173 tons (12,888,464), copper 13,687 tons (11,596), iron ore 490,003 tons (481,252), manganese 114,366 tons (55,841).

U.S. Copper Production.—The U.S. Copper Institute issued some very encouraging copper statistics for the month of March, the principal feature of which is an increase of about 10,000 tons in crude production to a total of 84,270 tons.

New Refractory.—A new refractory utilising Cuban chrome ore as a base, designed to facilitate the maintenance and repair of acid or basic brick open hearth furnace interiors, is being marketed by Basic Refractories, Inc., of Cleveland.

U.S. Steel Mills.—Of 56 steel rolling mills recently installed or scheduled to be built in the United States, 31 are in operation or scheduled for completion before the end of the third quarter of 1947. Thirty-six of the new rolling mills will produce flat-rolled steel products, which are in great demand.

South African Wattle Bark.—Wattle bark and extract from the Union of South Africa are in great demand by the United Kingdom. Export of extract during 1946 amounted to approximately 65,600 tons, compared with 66,300 tons in the previous year. About 52,000 tons of bark were exported, an increase of some 9600 tons over 1945.

Canadian Fertilisers.—A total of 645,325 tons of mixed fertilisers was sold in Canada during the 12 months ended June, 1946, compared with approximately 570,066 during the preceding 12-month period, the Dominion Bureau of Statistics discloses. Production of mixed fertilisers in Canada in 1945 totalled 539,462 tons, valued at \$16,256,250, compared with 542,520 tons valued at \$15,585,502 in 1944.

Franco-American Exploitation of Guyana Bauxite.—The Compagnie Francaise des Mines de Bor is reported to be negotiating with the Reynolds Metal Company regarding the establishment of a joint company to exploit bauxite deposits in French Guyana. The French company exploited formerly copper deposits in Yugoslavia. It has a share capital of 120,000,000 francs of which the French Government owns 82 per cent.

Luxembourg Chemical Industry.—In Luxembourg, a chemical industry based on coal is to be developed at Steinfort. The well-known Belgian Cockerill company and the Steinfort blast furnaces are to co-operate in this plan, which is estimated to require initial investments totalling some 40,000,000 francs. Machinery will be purchased in Belgium and in the United States and the works will provide employment for about 100 men.

New Companies Registered

Paint Products, Ltd. (434,002).—Private company. Capital £3000 in £1 shares. Chemical, etc., manufacturers. Directors: Geo., Geoffrey and D. Hughes. Registered office: 21 Chorlton Street, Manchester.

Ucal (Export), Ltd. (434,167).—Private company. Capital £100 in £1 shares. Exporters of and dealers in chemicals, etc. Directors: C. Gregory, G. Greenwood, J. Hearle. Registered office: Ucal Works, Cheltenham.

Artisec, Ltd. (433,962).—Private company. Capital £1000 in £1 shares. Manufacturers of raw materials for plastics, synthetic products and resins, products of oils and petrol, synthetic fibres, products of lactates, chemicals, etc. Directors: P. Gregory, Mary Gould. Registered office: Alma House, Rodney Road, Cheltenham.

P.A.C. (Photographics) Co., Ltd. (434,143).—Private company. Capital £20,000 in £1 shares. To acquire the photographic materials and chemicals department formerly carried on by P.A.C. (Chemicals), Ltd. Directors: F. Connell, J. Holden, K. Jacobson, G. White. Registered office: Rowsley Works, Reddish, nr. Stockport.

Sussex Laboratories, Ltd. (434,160).—Private company. Capital £100 in £1 shares. Farming and market gardening as applied to the production of basic materials and herbs for medicinal and toilet preparations and essential oil extraction; manufacturers of chemicals, chemical products, etc. Directors: N. and Lulu Shilling. Registered office: "Colonia," Ansisters Road, Ferring, Sussex.

Company News

A trading profit of £92,673 (£12,829) is announced by **Associated Clay Industries, Ltd.**

A quarterly dividend of 50 cents per share is payable by **Monsanto Chemical** (United States).

An interim dividend of 4 per cent has been declared by **Low Temperature Carbonisation, Ltd.**

Announcing a net profit for 1946 of £38,001 (£16,991), **Ayrton, Saunders Co., Ltd.**, is paying a dividend of 10 per cent (same).

Making a total dividend for the year to May 31, 1947, of 7½ per cent (5), **Broken Hill Pty. Co., Ltd.**, announces a dividend of 3½ per cent.

With the object of operating lignite mines at Bovey Tracey, in Devonshire, **British Lignite Products** has been registered as a public company, with a capital of £300,000 in 5s. shares.

The nominal capital of **Karen (Chemicals) Ltd.**, 203 Regent Street, London, W.1., has been increased beyond the registered capital of £1000 by £4000 in £1 shares.

Gross profit of **Aluminium Plant and Vessel Co., Ltd.**, for 1946 was £112,388 (£111,818), and a final dividend of 33½ per cent makes a total of 50 per cent (25).

The nominal capital of **Dormer Plastics, Ltd.**, 81B South Street, Romford, has been increased beyond the registered capital of £102 by £10,000 in £1 redeemable cumulative 6 per cent preference shares.

Subsidiary companies of **United Glass Bottle Manufacturers, Ltd.**, made a trading profit for 1946 of £488,972 (£455,417), net profit being £259,222 (£220,666). Combined trading profit was £737,838, with net profit of £322,011.

Consolidated profits of **British Oxygen Co., Ltd.**, for 1946 totalled £2,219,768 (£2,311,280), on which a final dividend of 12 per cent (8), making a total of 20 per cent (same), is to be paid. The parent company earned a net profit of £668,858 (£520,587).

Demand from the chemical industry for the company's lead products is considerably in excess of what it was before the war, stated the chairman of **British Lead Mills, Ltd.**, Mr. C. W. Hayward, at the annual meeting, when it was resolved to increase the capital to £150,000 by the creation of a further 750,000 Ordinary shares of 2s. each.

Chemical and Allied Stocks and Shares

BUSINESS in stock markets remained on moderate lines in most sections, but sentiment had the benefit of improvement in British Funds, and generally firm conditions prevailed. Industrials again presented strong features, buyers concentrating on shares of companies which in recent years were big E.P.T. payers and which it is assumed seem likely in future at least to maintain trading profits. A weak exception to the prevailing trend was provided by the iron and steel section, prices showing a fairly moderate although widespread decline in view of the revived fears that a Bill for nationalisation is to be introduced in the early stages of the next session of Parliament. These persistent reports seem designed to cause the maximum uncertainty and there is bound to be a growing demand for the Government to clarify its intentions. Iron and steel covers so many branches of activity that the existing uncertainty must result in confusion in the absence of an official indication as to which sections are likely to be subject to nationalisation.

Chemical and kindred shares have moved

higher where changed, buyers being attracted mainly by the expected benefits likely to accrue from the abolition of E.P.T. Imperial Chemical (50s.) remained under the influence of the full results and annual review and were also helped by news of the company's latest developments at Billingham. In other directions, W. J. Bush, still tightly held, were around 95s., and B. Laporte 97s. 6d., while among smaller-priced shares British Glues & Chemicals 4s. ordinary advanced to 19s. 9d. Major & Co.'s 2s. ordinary were 5s., and Lawes Chemical 15s. 9d. Elsewhere, Morgan Crucible have strengthened to 56s. 6d., and on further consideration of the results and strong finances and earning power, United Glass Bottle rose to 92s. 6d.

Glaxo Laboratories 10s. units remained prominent and have further advanced to £31, despite the directors' statement that dividend policy will not be decided until the Finance Bill becomes law. There has also been increased activity in British Xylonite £1 ordinary which have advanced nearly £2 to £11½, buyers being attracted by the fact that future net profits seem likely to benefit substantially from the end of E.P.T. Thomas De La Rue rose to 68s. 9d. also on E.P.T. considerations. British Industrial Plastics 2s. shares were 9s. 10½d., and Erinoid 5s. ordinary 16s. Among shares of South African companies quoted at London, General Chemical 5s. ordinary were 17s. Under the continued stimulus of the end of E.P.T., Borax Consolidated were good at 61s. 9d., British Aluminium 48s. 4½d., British Oxygen £5½, and Turner & Newall were 91s. 9d. Moreover, in front of the dividend announcement, Dunlop Rubber have been active around 78s., United Molasses also strengthened to 60s. 3d. awaiting the financial results.

Nationalisation fears have reduced Dorman Long to 27s. 3d., United Steel to 26s. 3d., Colvilles to 25s. 3d., Guest Keen to 47s. 6d., Stewarts & Lloyds deferred to 60s., Thomas & Baldwins to 12s. 3d., and Hadfields to 25s. 6d.

Boots Drug strengthened further to 63s. Beechams deferred were good at 30s. 9d., and on E.P.T. considerations Aspro have further advanced to 59s. Sangers were 37s., and Griffiths Hughes 68s. Oils failed to hold best levels, although Canadian and Mexican Eagle shares remained active and Ultramar were higher on balance.

British Chemical Prices

Market Reports

THERE has been a slight improvement in the overall supply position of industrial chemicals, but not sufficient to make any impression on the market, and the demand generally continues to be much in excess of

supplies. Prices have moved within narrow limits and no important changes in the home market quotations have been reported. An active demand persists for coal-tar products and a fair amount of new business has been placed.

MANCHESTER.—In various sections of the Manchester chemical market where an extremely tight supply position has been in evidence during recent months the position seems to be improving slightly, though it has not yet done so to the extent that things can be described as normal. The past week has seen a steady flow of inquiries for soda ash and other alkali products from home users, and for these as well as other leading heavy chemicals shippers have again been in the market. The cotton and wollen textile trades are taking steady deliveries of a wide range of products against contracts and replacement buying has been on a satisfactory scale. Prices are very firm in all departments. In the tar products market a steady absorption of supplies covers both light and heavy materials.

GLASGOW.—In the Scottish heavy chemical trade both home and export business has been adversely affected during this past week by the prolonged strike of the Glasgow dockers. Apart from this there is little change to report from the previous week. Inquiries from abroad still continue to be numerous but it has been observed that the price of sulphate of copper is not competitive.

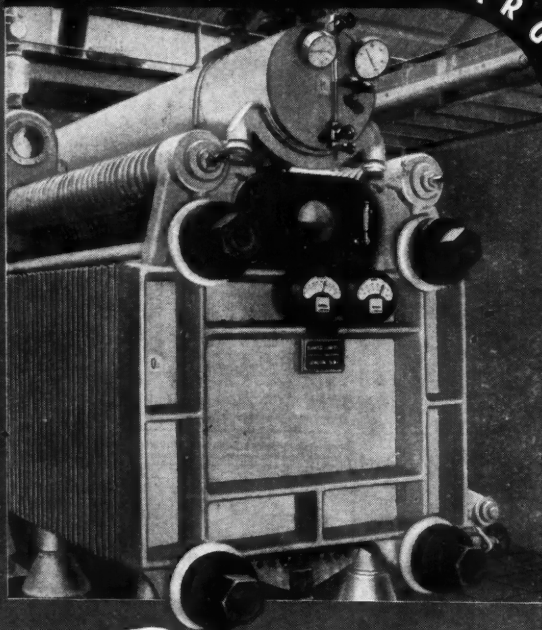
The Minister of Food announces that no changes will be made in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the four weeks ending May 31, 1947.

The Board of Trade have made an Order effective on May 12, 1947, increasing the maximum prices of ground sulphur by 7s. 6d. per ton.

German Chemical Directors on Trial

Twenty-four of the principal directors of Germany's vast I.G. Farbenindustrie undertaking are now on trial at Nuremberg charged with the parts they played in preparing for and waging aggressive war and with crimes against humanity. The charges recall that the industrialists in 1932 bolstered the faltering Nazi party with a subsidy equivalent to £20 million and that I.G. Farbenindustrie prepared for chemical warfare "with special intensity" and appropriated the whole of the Polish chemical industry when Poland was overrun. Half the 200,000 employed in German chemical works were "slave labour."

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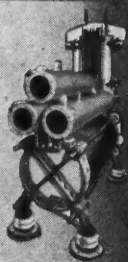


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German Technical Reports

FOLLOWING are among the latest technical reports from the Intelligence Committee in Germany, copies of which are obtainable from H.M. Stationery Office at the prices quoted.

BIOS 459. German coated abrasives industry (1s. 6d.).

BIOS 720. Metallurgical research and testing laboratories in the Stuttgart area (16s.).

BIOS 853. *I.G. Leverkusen*: Azobenzene (1s.).

BIOS 1065. Investigation of German plastics plants. Part V: Thermosetting resins. (Part I—C.I.O.S. XXIX—62, Part II—C.I.O.S. XXXIII—23, Part III—B.I.O.S. 445, and Part IV—B.I.O.S. 433). (17s. 6d.).

BIOS 1066. German glass manufacturing equipment (1s. 6d.).

BIOS 1118. Final report on the investigation of the use of industrial glassware for chemical plants in Germany (6d.).

BIOS 1133. Materials and machines used in the manufacture of cellulose acetate rayon (6s. 6d.).

BIOS 1143. Manufacture of α -nitronaphthalene, α -naphthylamine, and α -naphthol at *I.G. Farbenindustrie*, *Leverkusen* (2s. 6d.).

FIAT 927. Production of high alumina

slags in blast furnaces and allied processes for recovering alumina (3s.).

FIAT 929. Effluent treatment practices in some of the chemical factories in the French, British and American zones in Germany (3s. 6d.).

FIAT 960. Polyethylenimine and its use in paper making (6d.).

BIOS 846. German chlorine plants in the American, French and British zones. Part 1: Chlorine production (10s.).

BIOS 987. German dyestuffs and intermediates industry. Vat dyestuffs and intermediates (16s. 6d.).

BIOS 1144. *I.G. Farbenindustrie*: (1) Manufacture of nitration products of benzene, toluene and chlorobenzene at *Griesheim* and *Leverkusen*. (2) Manufacture of aniline and iron oxide pigments at *Uerdingen* (3s.).

FIAT 972. Manufacture of chlorbromomethane fire extinguishing agent "CB" (1s.).

Evaluation reports also available (2d.) include:

BIOS E/R 262. Coke production and by-products.

BIOS E/R 519. *Chemische Fabrik Weseling*: Inorganic chemicals/sulphur extraction.

Drying Trays

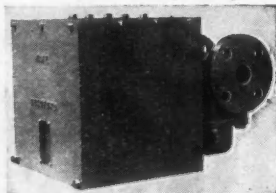
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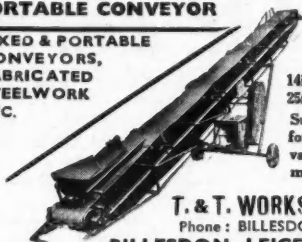
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Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Treatment of molten magnesium, and magnesium base alloys.—Aluminum Co. of America. Oct. 8, 1945. 14376/46.

Catalytic treatment of oils of any origin for the production of various hydrocarbons.—D. Balachowsky. Oct. 9, 1945. 30151/46.

Printing members.—B.B. Chemical Co., Ltd. Oct. 10, 1945. 30119/46.

Urea derivatives.—Ciba, Ltd. April 18, 1945. 10452/46.

Magnetic separation of very fine pulverulent products or magnetic removal of iron therefrom.—Compagnie de Produits Chimiques et Electro-Metallurgiques Alais, Froges & Camargue. Oct. 12, 1945. 29867/46.

Making a monaryldihalosilane.—Dow Chemical Co. Oct. 4, 1945. 32729/46.

Dyestuffs intermediates.—E.I. Du Pont de Nemours & Co. Oct. 8, 1945. 27701/46.

Aluminium alloys.—L. K. Gulton. Oct. 9, 1945. 28459/46.

Amino acids.—Merck & Co., Inc. Oct. 10, 1945. 28761/46.

Synthetic resins.—Mississippi Valley Research Laboratories, Inc. Oct. 10, 1945. 30305/46.

Soldering or annealing of palladium and its alloys.—Mond Nickel Co., Ltd. Oct. 13, 1945. 30609/46.

Manufacture of dentures and other prostheses, and the preparation of synthetic resin material therefor.—Nederlandsche Chemische Fabriek Van Kunsthasen Fakusta C.V. Sept. 1, 1944. 8278/47.

Pyrazolone azodyestuffs.—Sandoz, Ltd. Aug. 31, 1944. 20595/45.

Acylacetylated derivatives of amines.—Soc. Anon. de Materes Colorantes et Produits Chimiques Francolor. Jan. 10, 1944. 11922/45.

Ceramic body having longitudinal passages.—Spolek Pro Chemekou a Hutni Vyrobu Narodni Podnik. June 28, 1945. 7515/47.

Insecticides.—United States Rubber Co. Oct. 3, 1945. 22792/46.

Nitric oxide.—Wisconsin Alumni Research Foundation. Aug. 16, 1943. 7683-84/47.

Plant for treating solid objects in a liquid bath.—N.V. Philips' Gloeilampenfabrieken. July 15, 1944. 7132/47.

Rotatable drum liquid baths.—N.V. Philips' Gloeilampenfabrieken. May 30, 1944. 7133/47.

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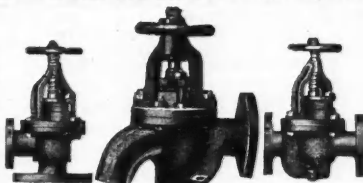
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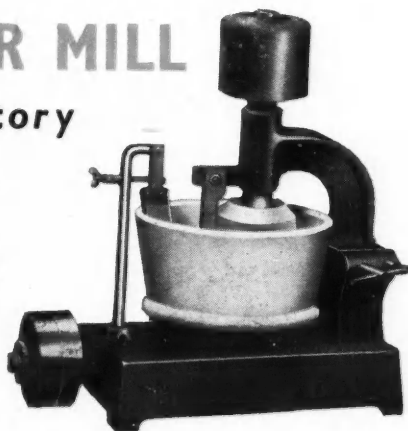
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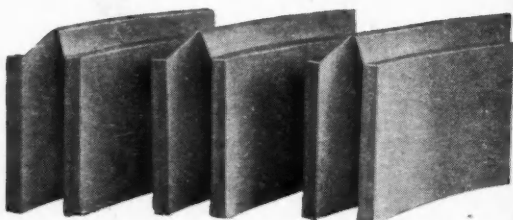
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